the OIL AND GAS JOURNAL

MARCH 4, 1957

5 articles on what's new in Production Techniques

★ Automatic Water Flooding
★ Automatic Custody Transfer
★ Logging Shaly Sands
★ Acidizing Injection Wells
★ Tailored Well Fracturing

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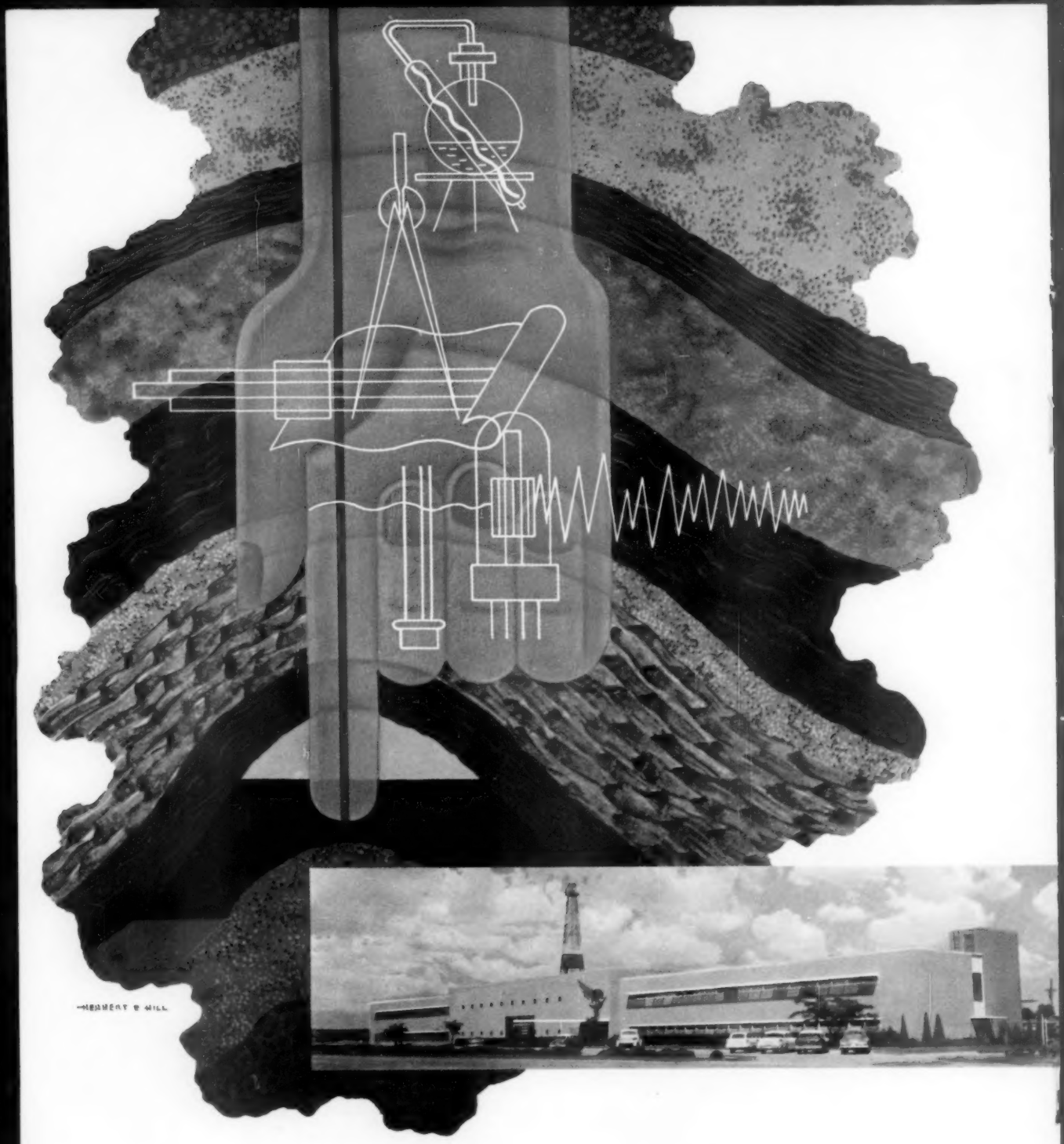

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A Glance Ahead

- **Increased volatility in motor fuels** will get close scrutiny this summer. C.F.R. will direct road tests to study not only vapor lock but also the tendency of some fuels to foam or "dry out" in glass bowls of carburetors at high under-the-hood temperatures. The foaming is called by some the "root beer" phenomenon and is associated with preignition and other knocking tendencies in engines.

- **An area to watch in coming months** is the little explored Bull Mountain basin of Central Montana. The reason: Texota Oil Co.'s recent Amsden discovery in Musselshell County, 6 miles southeast of Gage Dome. This well moves production farther toward the center of the basin, where there has been little drilling. The discovery was completed for 554 bbl. daily on a small choke and is the biggest Amsden news in Montana since Wolf Springs was opened in 1955.

- **Variable-speed drives for pump stations** on liquid lines are attracting interest in the pipeline industry. Ohio Oil Co. is leading the way in this new application of a fluid-drive coupling. Ohio proved its feasibility on a 900-hp. unit on its products system. The advantages in operating flexibility for handling throughput changes led the company to install the coupling at the New Roachdale, Ind., station on its 22-in. crude line. The coupling permitted Ohio to meet pumping requirements with two 2,500-hp. units rather than three 2,000-hp. units which would have been installed otherwise.

- **A new type of drilling platform** for California coastal waters will be built soon in a West Coast shipyard. It will be a three-legged structure designed for 100-ft. water. It will be floated to the drill site and up-ended. The platform will hold 21 wells and can serve as a production platform. Cost will be less than $400,000. A similar six-legged structure has been designed for 200-ft. water.

- **Plotting of seismic cross sections** can be done 25 times faster than manual methods by a new, automatic high-speed plotter. The machine receives data from either punch cards or tape or data fed manually through a keyboard. It then plots any data for which an X-Y location has been specified. In seismic profiles it posts depth, migration (as the X-Y coordinate), dip angle, spread, reflection quality, shot point, and shot time. First of the new plotters was shipped last week by its Los Angeles manufacturer.

- **Look for more discoveries** this year in Canada's newest oil region—British Columbia. There are now 29 rigs running, a new record for the province. Most rigs are headed for the gas zones in northeastern British Columbia, but there's a trend toward oil exploration, too. There is only one real oil field in B.C.—Boundary Lake—but there is production also at Fort St. John. Together they produce a little over 1,000 bbl. a day.

The OIL AND GAS JOURNAL

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TECHNOLOGY–OPERATION

Drilling-Production

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Automatic Control at Naval Reserve Pool Flood 84
By Morris Todd
Automatic control and monitoring is one of the main features at the rapidly expanding water flood in Naval Reserve pool, west-central Osage County, Oklahoma. The 50,000-bbl. per day operation requires only one man for operation.

Experimental L.A.C.T. Unit at Naval Reserve Pool 88
By C. R. Reed

Saturation and Porosity From Electric Logs in Shaly Sands 89
By A. J. de Witte
Here are the outline and some of the details of an engineering approach to the method of obtaining saturation and porosity in shaly sands from electric logs.

Humble Tries L.A.C.T., Approves It 94

Stabilized Acid For Treating Injection Wells 100
By C. F. Parks and W. N. Helberg
Permeability of water-injection wells may be reduced by deposits in the pores of the formation. A new acid which will remove most of these deposits offers an excellent means of conditioning these wells.

Custom-Designed Well Stimulation 102
By R. W. Coburn
Here is a procedure which insures fracturing of most of the perforations in a cased well. Better production increases are resulting from it.

Five-Year Drilling Program for Carter-Knox 110
By Norman S. Morrisey
Operators in the deep Simpson producing area of Carter-Knox oil field are planning a 5-year drilling program. This is probably a major gas-condensate reservoir that will require at least 30 wells.

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By Dr. John M. Campbell

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Refiners Move in on Corrosion 108
By M. S. Northup
A study by the subcommittee on corrosion, division of refining, American Petroleum Institute, shows that corrosion is costing the industry some $300,000,000 per year.

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Humble Pipe Line Co. Tries L.A.C.T., Approves It 94
By Larry Resen
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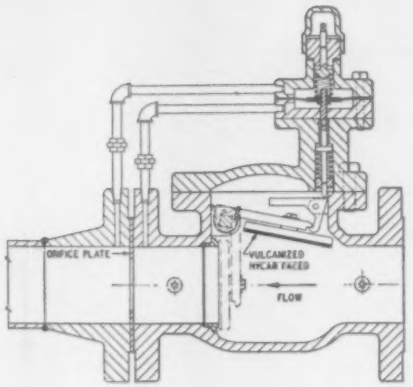
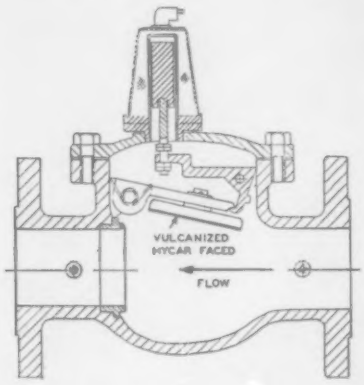
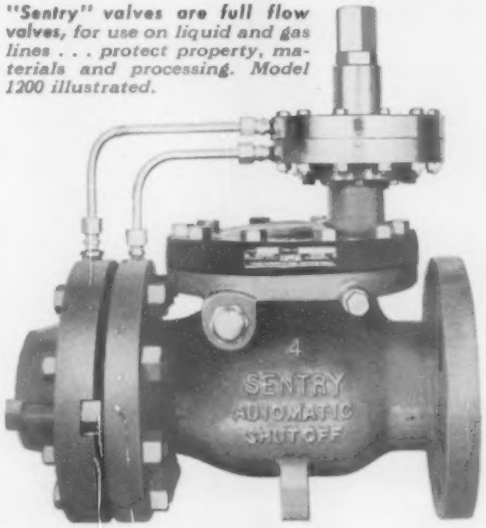


Model 1200. "Sentry" **excess flow valve** *automatically and instantaneously shuts off when the rate of flow in the line exceeds a predetermined rate.*

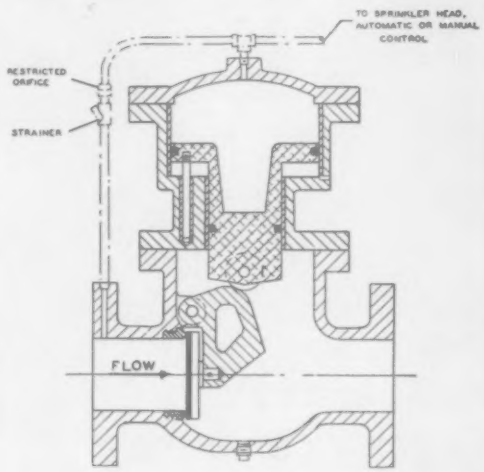


Models 1700 and 1800 "Sentry" **solenoid shut-off valves** *operate by remote electrical control automatically and instantaneously. In Model 1700, solenoid is energized, in Model 1800 solenoid is de-energized to maintain flow.*

"Sentry" valves are full flow valves, *for use on liquid and gas lines . . . protect property, materials and processing. Model 1200 illustrated.*



Other types "Sentry" Valves: high-pressure and low-pressure and over temperature shut-off valves available.



Model 3000 "Sentry" **piston operated quick-opening valve** *opens instantaneously when the pressure above piston is released. Ideal for deluge systems — and for remote opening and closing of fuel line.*

Now Coppus brings you "Sentry"® Valves for automatic protection

These valves are *patented* quick-closing latch type and quick-opening piston type. All are full flow valves.

Latch-type "Sentry" valves are widely used in the chemical, petroleum and gas industries for closing automatically and instantaneously gas, process and fuel lines. The piston type valve can be automatically or manually opened and closed from any remote location. It is ideal for deluge systems, operates instantly; closing of this valve is against the flow, eliminating water hammer.

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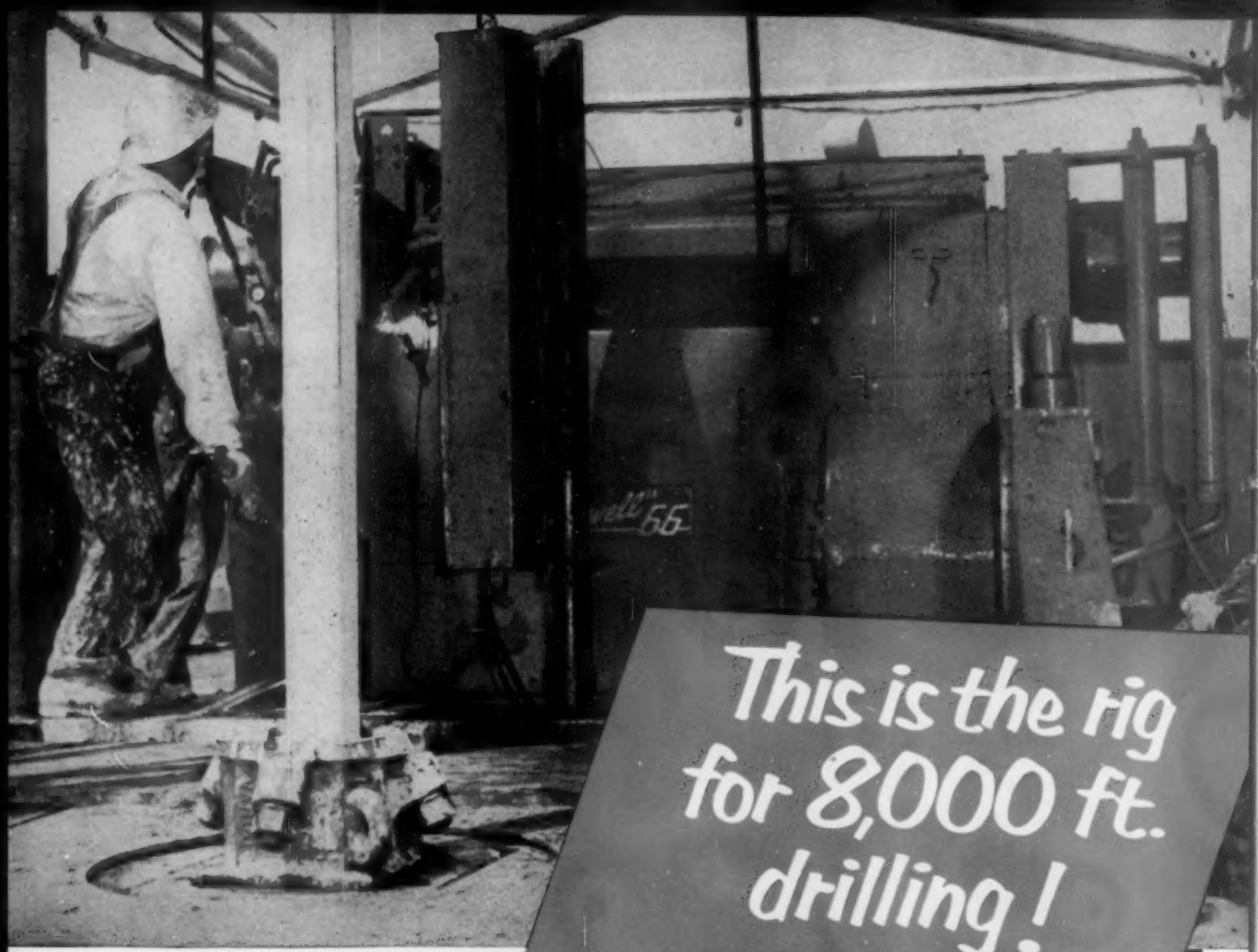

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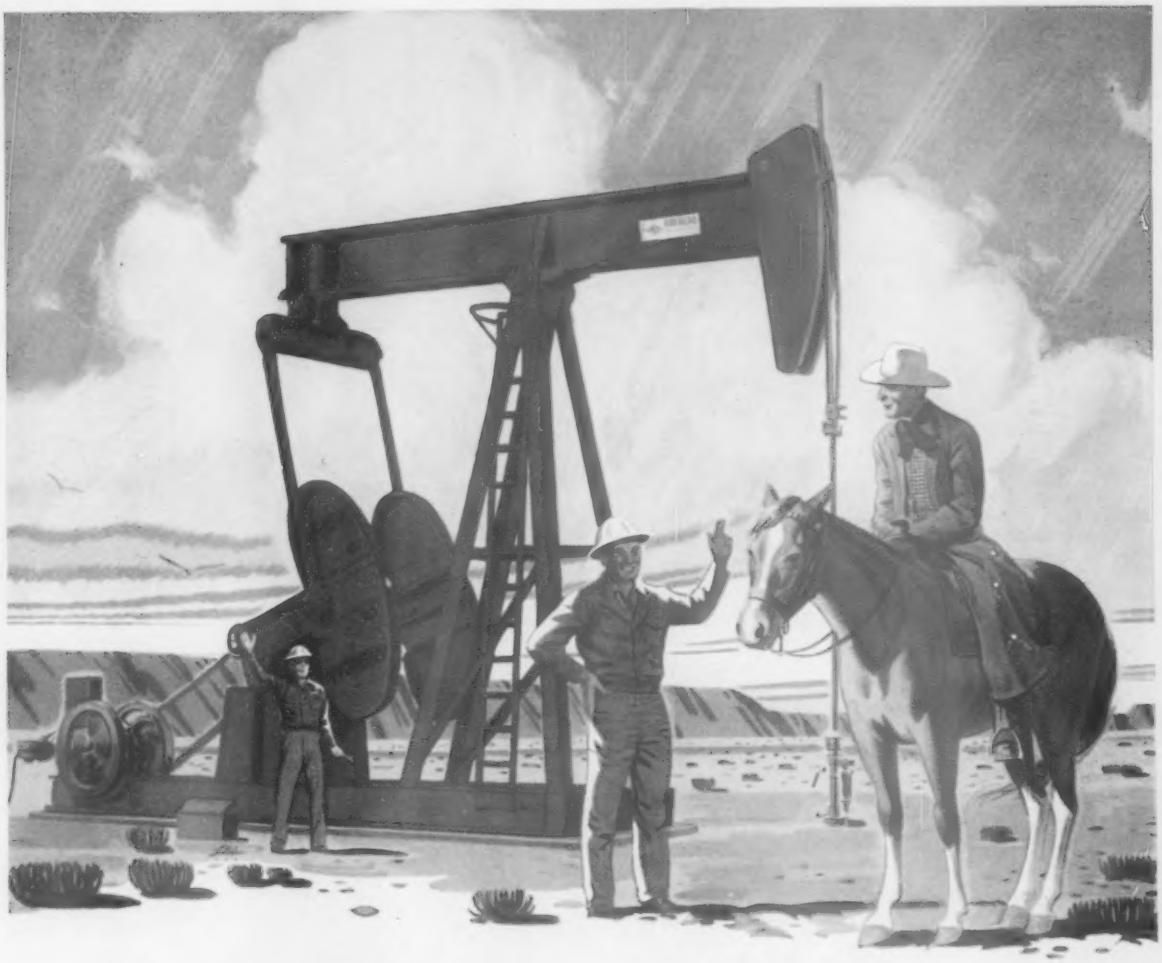

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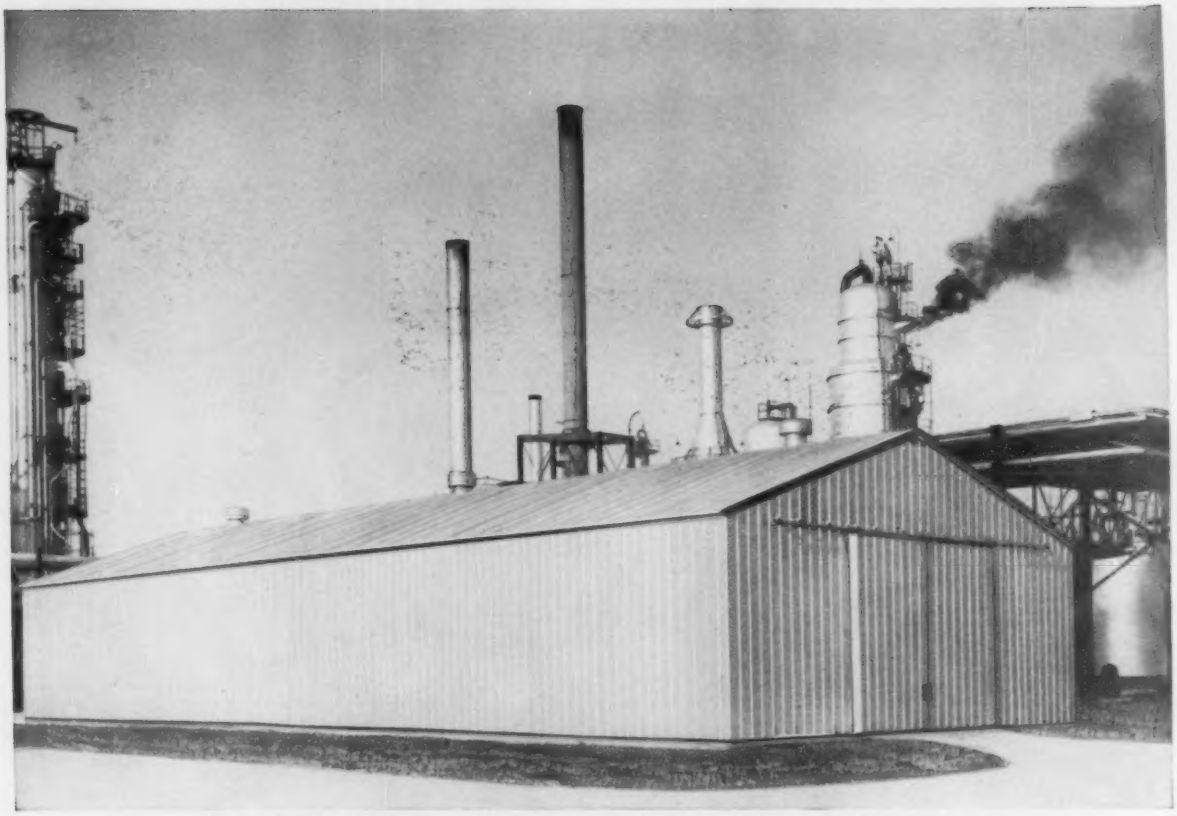

Butler storage building 100 feet by 40 feet. Offers maximum storage area in a quality building that is modest in cost.

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Butler building used as an oil tool supply store. Note how the attractive front adds to its commercial appeal.

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News about

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Geon rigid vinyl pipe makes

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REMARKABLE rigid vinyl pipe made from Geon possesses a combination of outstanding chemical and physical properties that make it the sweetest of all piping systems for sour crude oil.

This piping is unaffected by galvanic corrosion and holds up under sunlight, moisture, heat and cold. It does not support fungi and bacteria and it resists oil, acids, alkalis and most chemicals.

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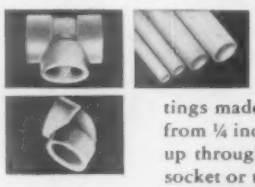
To all these factors, add Geon pipe's light weight, handling ease, joining simplicity and low maintenance requirements and it's easy to see why the best pipelines laid for sour crude oil are made of Geon. Geon pipe is also widely used for handling salt water, chemicals, cold water, acid fumes and corrosive gases.

For more information on the properties of rigid Geon compounds 8700A and 8750, write Dept. DT-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



Several manufacturers offer rigid vinyl pipe and fittings made from Geon. Sizes range from ¼ inch for instrument air lines up through 12 inches. Fittings are socket or threaded. Vinyl is normal or high impact.

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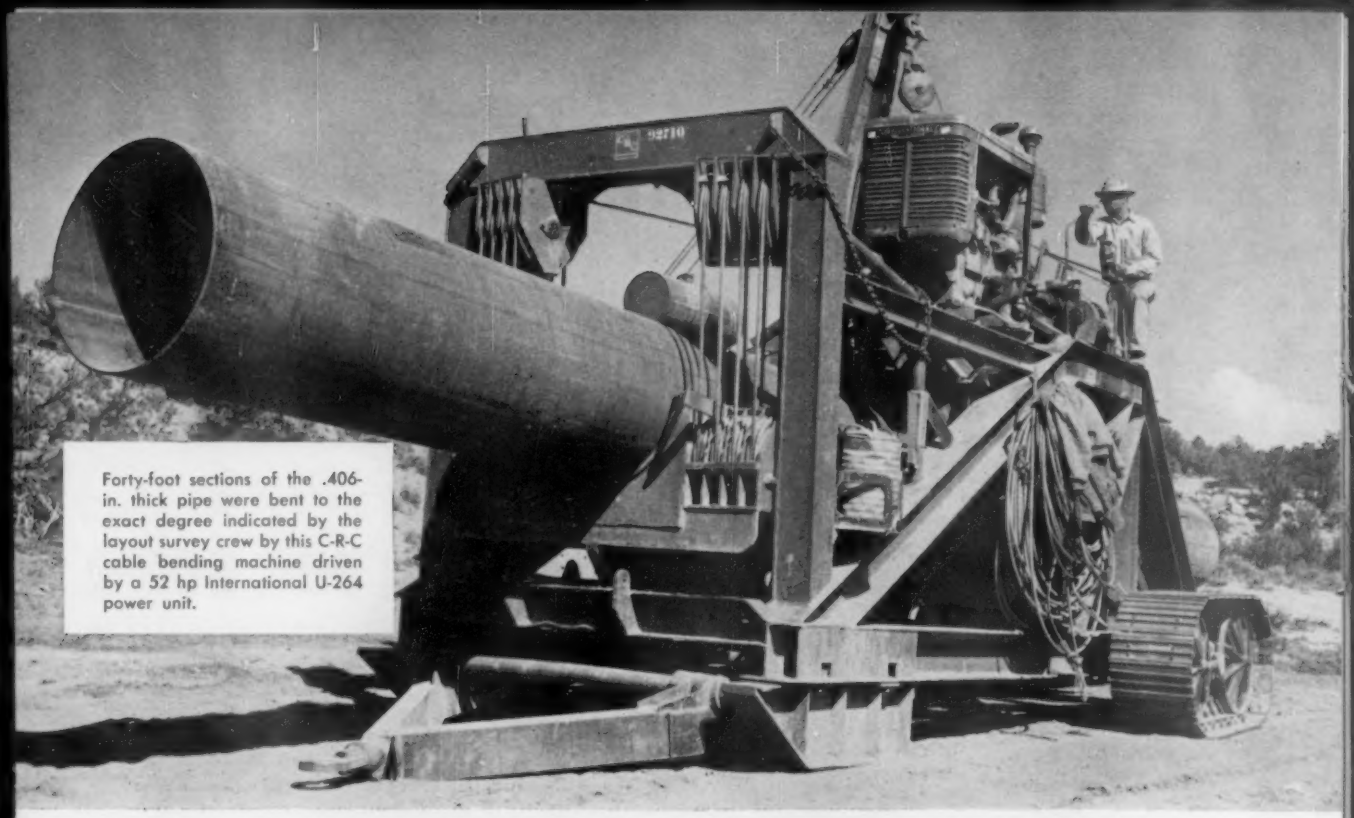


Forty-foot sections of the .406-in. thick pipe were bent to the exact degree indicated by the layout survey crew by this C-R-C cable bending machine driven by a 52 hp International U-264 power unit.

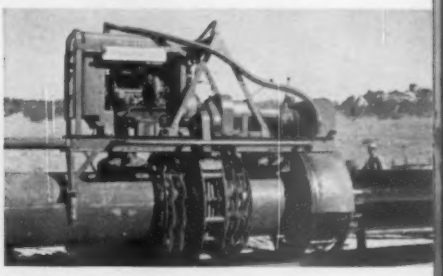
Power Units beat desert heat
preparing pipe on new 34-in. line

El Paso Natural Gas Co. speeds spread with rugged trio of International-powered C-R-C machines

Laying a 34-inch pipeline through the New Mexico heat at a two-mile-a-day clip is quite a feat. But that's what an El Paso Gas Co. spread did in completing a 17-mile section of the new line carrying gas from the San Juan Basin to consumers in California.

Plenty of the credit for the lively pace maintained by the spread goes to three International-powered C-R-C pipe bending, cleaning, and wrapping machines that beat the desert wind and weather and speeded the spread all the way.

Whether you drill, pump, or pipeline, you can get this same dependable engine performance by specifying one or more of 16 International carbureted or diesel power units. Internationals range from 10 to 200 hp and they give you bonus production from your powered machines, at lowest cost, too. See your always-available International Power Unit Distributor or Dealer soon.



Welded and tested pipe gets a dope coating from a C-R-C doping machine driven along the pipe by an International U-372 power unit.

The wrap-up operation moved swiftly as the C-R-C wrapping machine crept steadily down the 34-in. pipe. An International U-164 power unit is the source of power.

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Full line contact of Timken bearings gives them extra load-carrying capacity. Their tapered construction lets them take radial and thrust loads in any combination. Timken tapered roller bearings practically eliminate friction because they are designed according to geometric law to give true rolling motion and precision manufactured to live up to their design.

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Whether you buy or build machines, make sure you get all these advantages in the bearings. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN TAPERED ROLLER BEARINGS ROLL THE LOAD

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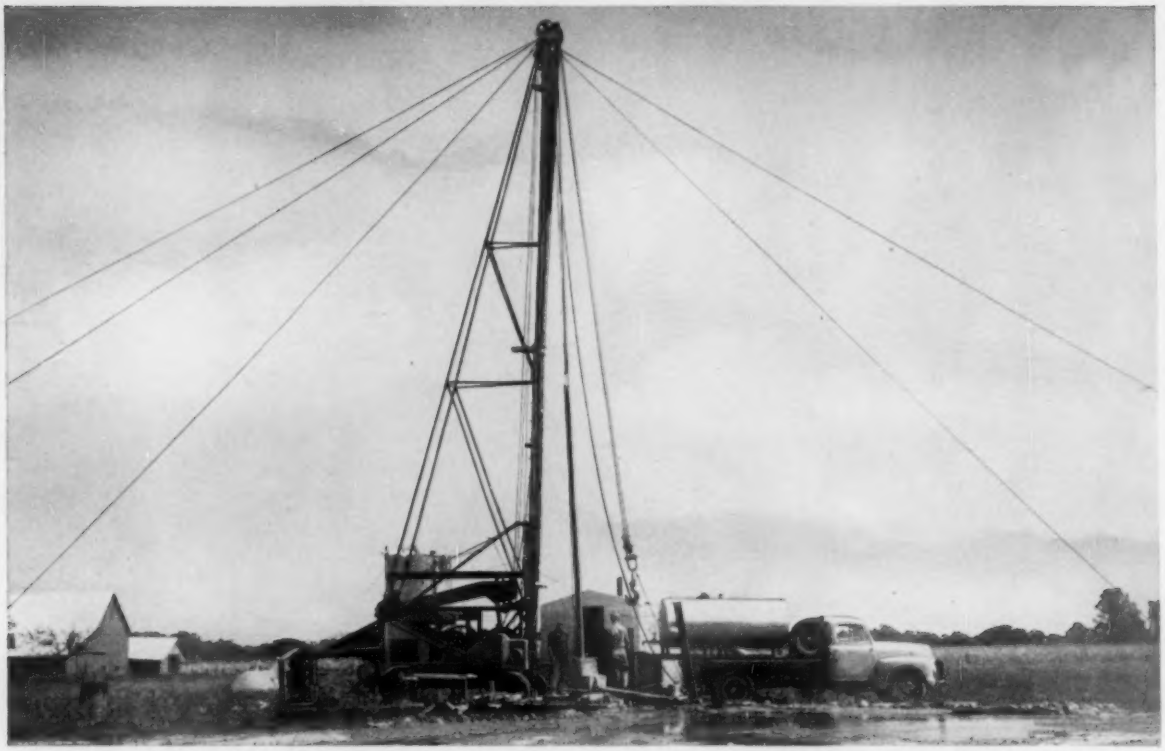

Steady, dependable performance . . . that's what you expect and get with a versatile Bucyrus-Erie spudder on your drilling and servicing operations. These modern mobile rigs speed top-to-bottom drilling, drilling-in, or the multiple jobs included under servicing and well completion. They are designed to assure pace-setting performance hole after hole with quick easy moves, and reduced costs all down the line. They are built to stand up to full-time diet of rugged duty.

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60-L Top-to-bottom drilling to 1,500 ft.; Servicing to 2,000 ft.; Swings up to 2,750 lbs. of tools.

28-L Top-to-bottom drilling to 2,500 ft.; Servicing to 3,000 ft.; Swings up to 3,700 lbs. of tools.

36-L Top-to-bottom drilling to 3,500 ft.; Servicing to 4,000 ft.; Swings up to 5,000 lbs. of tools.

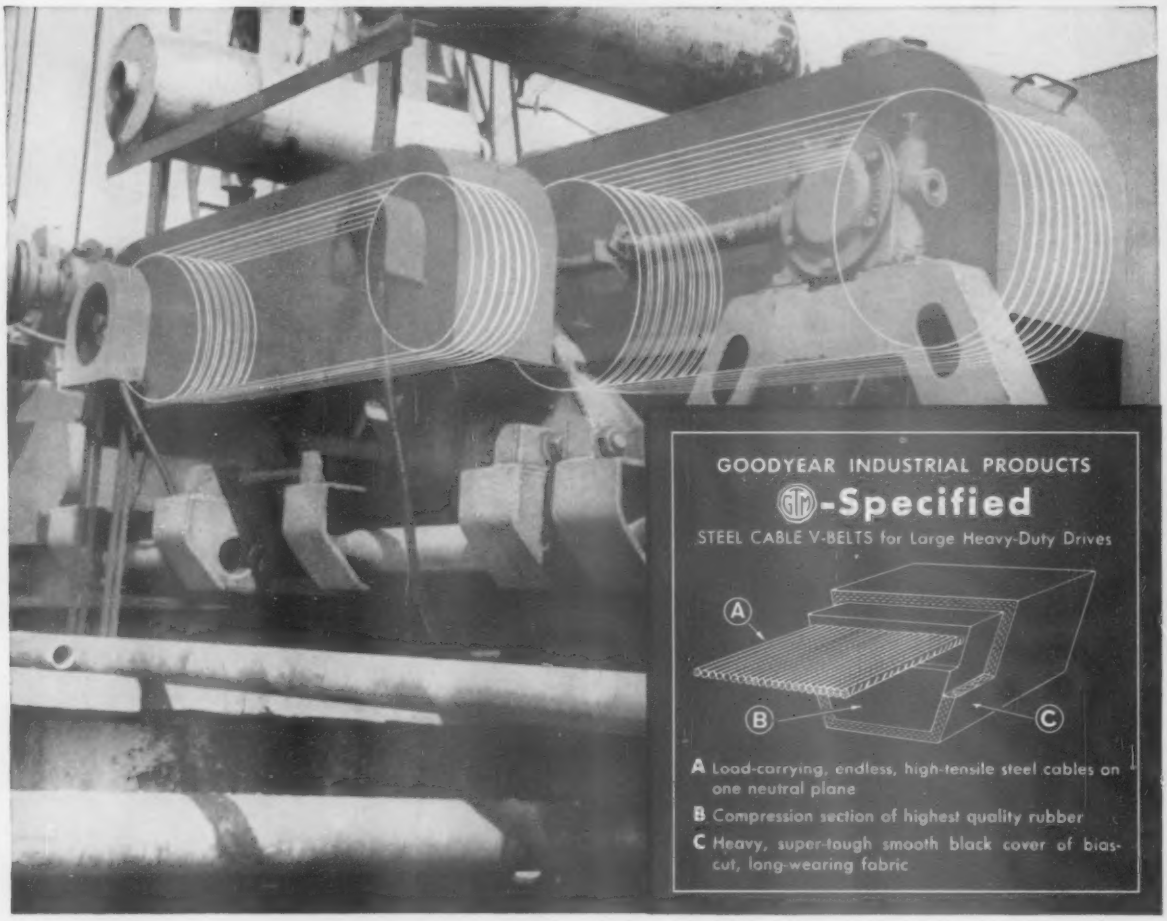
48-L Top-to-bottom drilling to 6,000 ft.; Servicing to 7,000 ft.; Swings up to 6,700 lbs. of tools.

Join the thousands of satisfied owners who know you can count on Bucyrus-Erie spudders to deliver top performance year after year. See your nearby Bucyrus-Erie distributor or write for complete information on any of these spudders. Do it soon. 32556

Quality in the making: Ruggedness and durability are built into the frames and derricks of Bucyrus-Erie spudders through use of most modern electric welding techniques.

BUCYRUS ERIE

SOUTH MILWAUKEE
WISCONSIN


GOODYEAR INDUSTRIAL PRODUCTS
G.T.M.-Specified
STEEL CABLE V-BELTS for Large Heavy-Duty Drives
A
B
C
A Load-carrying, endless, high-tensile steel cables on one neutral plane
B Compression section of highest quality rubber
C Heavy, super-tough smooth black cover of bias-cut, long-wearing fabric

G.T.M. belts drives that drill 105,000 feet of hole

WHEN other systems were used on the compound and pump drives of this portable rig, service life was low and maintenance high. A change to V-belts was considered, but the operators were wary of the extremely limited take-up space.

The G.T.M. – Goodyear Technical Man – confidently recommended matched sets of Steel Cable V-Belts (see blueprint). Result: At last report, these super-belts had drilled over 105,000 feet of hole – faster, smoother, cheaper – and were still going strong. Another result: Steel Cable V-Belts are now specified by the manufacturer for rigs of this type.

Similar service on V-belts or other rubber goods may be yours by consulting your Goodyear Distributor or the G.T.M. Or write: Goodyear, Industrial Products Division, Akron 16, Ohio.

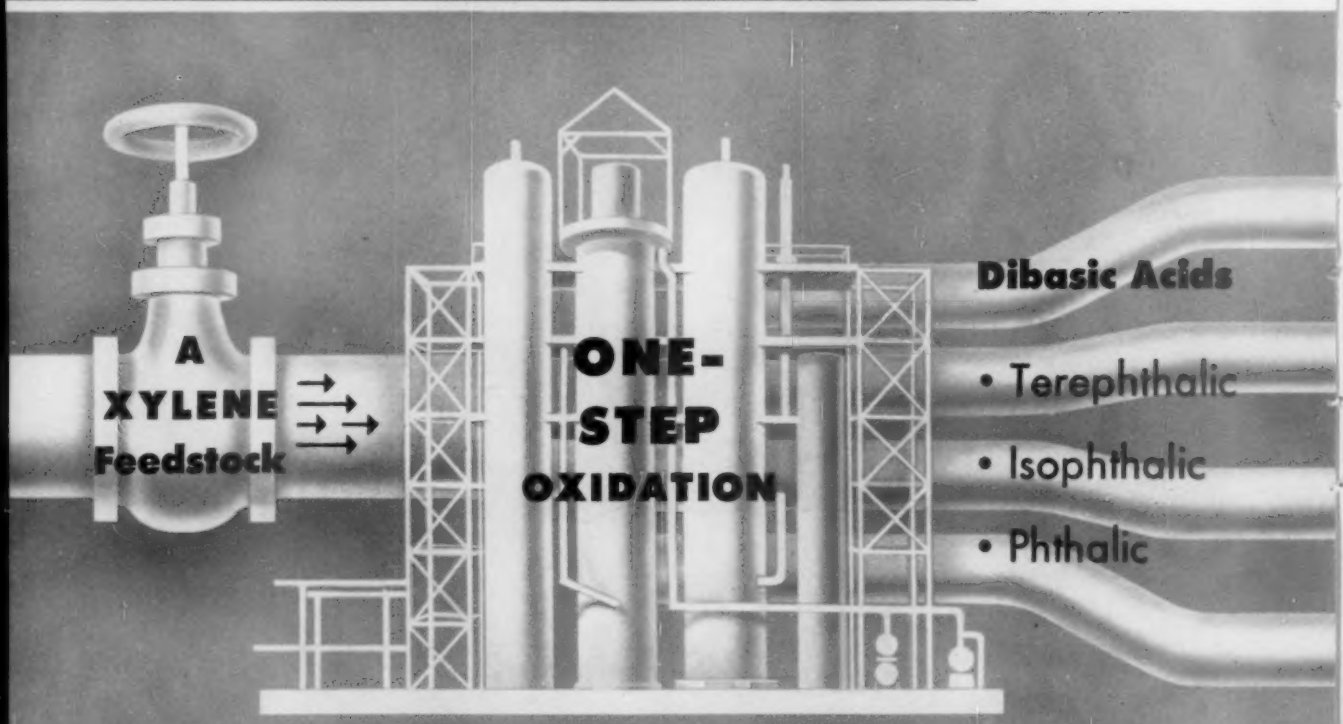
STEEL CABLE V-BELTS by

GOODYEAR

THE GREATEST NAME IN RUBBER

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

AROMATIC CHEMICAL BREAKTHROUGH



According to Dr. Ralph Landau, Executive V.P. of SD, "Never before has a private engineering, research and design group created wholly by itself, with its own funds, such a major technical discovery and development in the chemical field. The sale of this process further confirms SD's position as the world's leading independent company devoted to process development and plant design in the organic chemical field. In only 10 years, SD has undertaken over forty different chemical plant projects, a greater number and diversity than those handled by all but the largest chemical operating companies."

SD Group Sells Exclusive Worldwide Rights to Standard Oil Company (Indiana)

Having acquired exclusive worldwide rights, Standard decided to build a $10,000,000 plant based on this aromatic chemical breakthrough. SD is designing this plant for Indiana's subsidiary, Amoco Chemicals Corporation.

The successful conclusion of this project by SD and its associated companies is another example of SD's creative approach to many industrial chemical problems. In this case, Amoco's plant will have a new "production flexibility." One basic plant and equipment will produce a variety of chemicals from a variety of feedstocks. This is an almost complete answer to one of a chemical company's major problems — shifting markets and raw material sources.

If you are planning an expansion or diversification program in the field of organic chemicals, it will pay you to consult SD. Whether your project requires developing a new process, acquiring an existing process or engineering one of your own, you will profit by SD's confidential service. SD and its wholly owned construction subsidiary, SD Plants, Inc., will assume complete responsibility from earliest planning, through design and construction, to supervision of start-up and initial operation.

SCIENTIFIC DESIGN COMPANY, INC.
Chemical Processes • Plant Design • Construction
Executive Offices:
Two Park Avenue, New York 16, N. Y.

Engineering Offices:
Jersey City, New Jersey
Research Center:
Manorhaven, L. I., New York

SD134

J&L Service

wraps up the world's most wanted

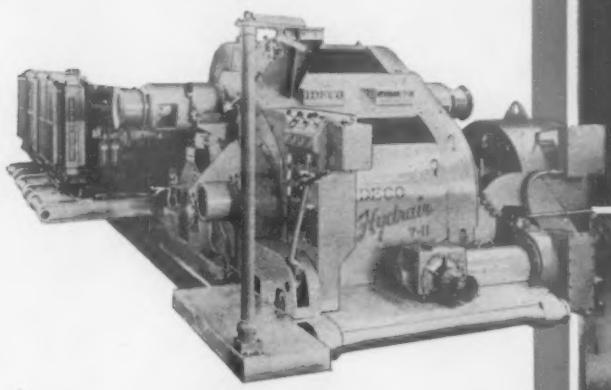
Rotary Rigs

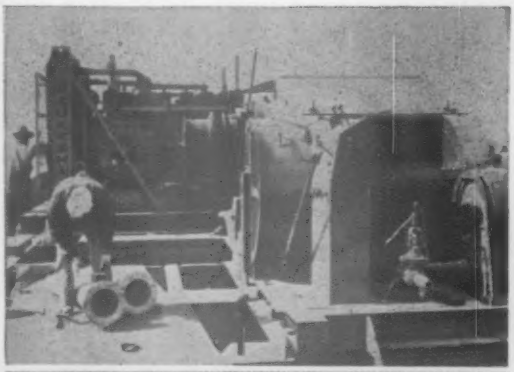
A driller's natural desire to own the last word in equipment has made Ideco the most wanted rotary rigs in the world.

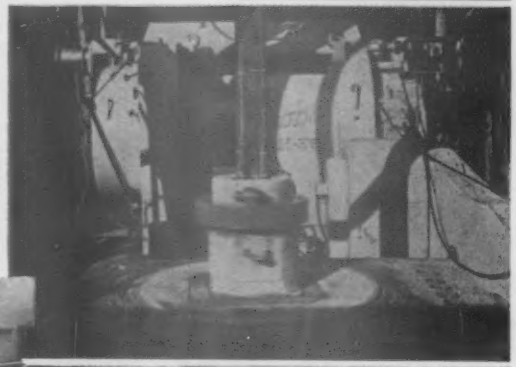
J&L parts service wraps up this situation — makes these finest of all rigs the best buy in the United States and Canada.

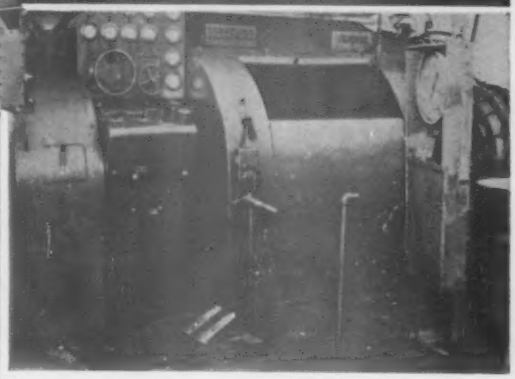
J&L has an Ideco designed and rated to do the job you have in mind and — thanks to J&L service — keep on doing it.

For detailed descriptions, specifications, performance characteristics, get your J&L store on the telephone. Ask for Catalog No. 55.









Rig capacities from 2,500′ to 20,000′ with 4½″ drill pipe. Rigs to 6,000′ capacity can be trailer mounted.

"Hydrair" hoists combine a hydraulic torque converter drive with air clutch and air controls.

Power rigs have a mechanical or fluid-coupling drive, with air clutch and air controls.

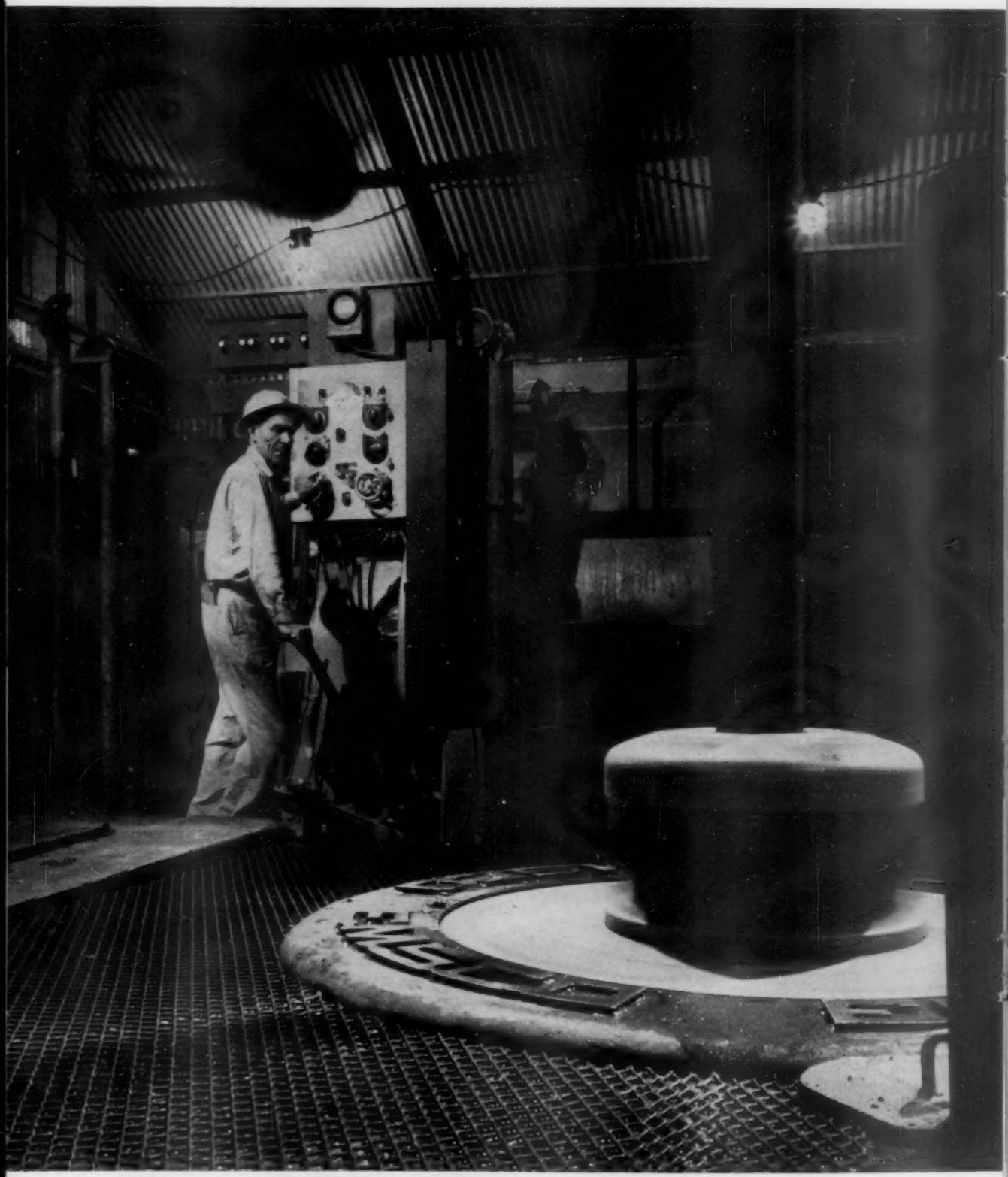
Jones & Laughlin

SUPPLY DIVISION – Tulsa

SERVING THE UNITED STATES AND CANADA

10-MA

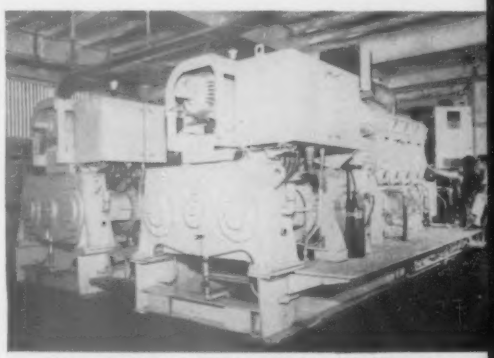
A landlubber goes to sea . . .



Driller's control stand is located beside draw works and just behind rotary table. From this point the driller can oversee every operation. From one panel he has complete control of all Diesel-electric equipment.

. . BIG CHIEF USES ELECTRO-MOTIVE POWER on first offshore rig

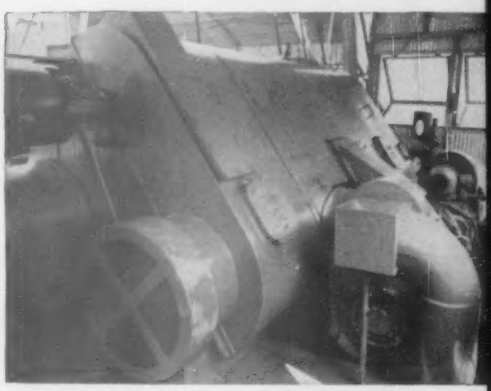
Big Chief Drilling Company of Oklahoma City was a landlubber for twenty years before plunging into offshore drilling. More than a year was spent studying offshore problems, designing equipment before launching Rig 34. Why they picked Electro-Motive Diesel-Electric Power is told here:



Conveniently located in a shed beside the mast are the two 975-hp generating sets. Each drives two 500-kw dc generators and comes complete on skids with controls and cooling system. Note how cables to drive motors are neatly routed on overhead trays.

Deck cost cut to minimum

Platform deck area measures only 88 by 145 feet. Living quarters, fuel storage, mud, water, pipe racks, etc., alone take 88 by 110 feet. In the space left, (35x88) Big Chief's engineers had to pack a complete rig and provide for location of six wells. Solution: Electro-Motive Power with flexible cables permitted locating components in a space-saving three story design.



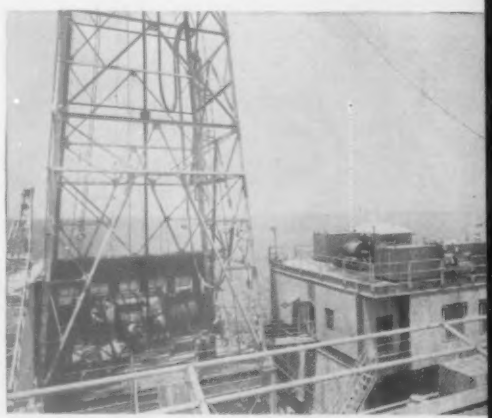
Two 625-hp dc drive motors supply power for draw works. Generators are connected to these motors through electric cables, permitting complete flexibility of arrangement. In fact, the entire Diesel-electric system can readily be adapted to any platform.

Big power, simple control

Two 900-hp GM Diesel engines driving four 500-kw dc generators supply power to 625-hp drive motors on mud pumps, rotary and draw works. Coupled with this power is a simple and accurate control system that provides smooth and rapid acceleration of loads with positive control of speed and torque. Result: flexible control for faster, lower cost drilling.

Matched components

Electro-Motive Power is a complete drilling power system. Each component was designed and built to work together—one manufacturer—one source of responsibility. The tested dependability and widespread acceptance of this power is proof of its drilling advantages on land or water. For your convenience there's an Electro-Motive Representative located in every major drilling area.

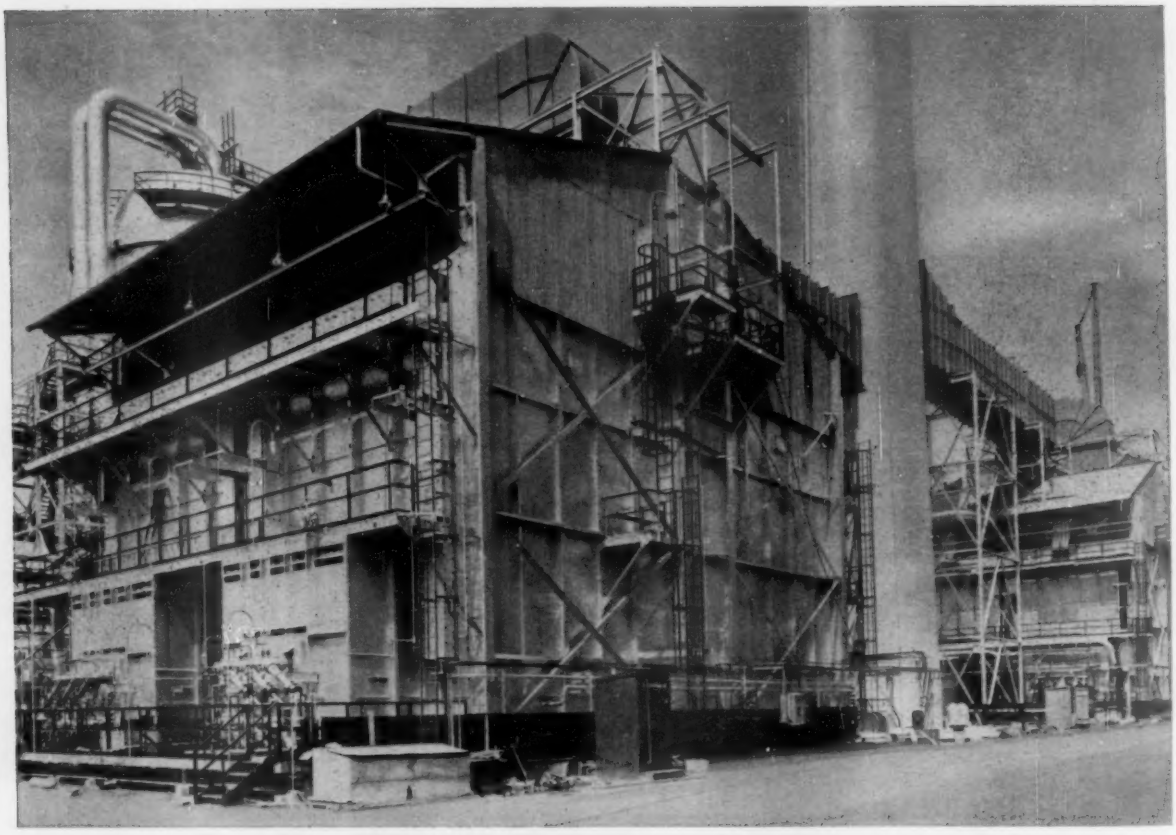


This view from the heliport which tops the crews quarters shows the simple and efficient layout of Rig 34. At left is the driller's stand, at right the engine generator shed. Below deck are pumps and tanks for mud, fuel and water.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS LA GRANGE, ILLINOIS

In Canada: General Motors Diesel Limited, London, Ontario

Petroleum industry sales offices: Tulsa, Oklahoma; Houston, Texas; Dallas, Texas; Morgan City, Louisiana; Pasadena, California.



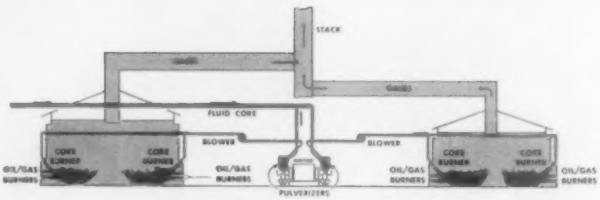
357,000,000 btu/hr

from two FW direct-fired oil heaters designed to burn FLUID COKE

SUPPLYING the heat requirements of the world's highest capacity crude distillation unit at the new ultra-modern Delaware Flying A Refinery of Tidewater Oil Company, the two Foster Wheeler direct-fired oil heaters shown above have a heat absorption capacity of 357 million btu per hr. The petroleum industry's first direct-fired heaters designed to burn fluid coke, they are capable of heating 130,000 bbl of crude per day.

Fluid coke can be burned at the rate of approximately 220 tons per day, supplying one half of the total direct heat requirements when operating at full capacity. Fuel oil or gas burning will supply the other half.

This installation is another example of Foster Wheeler's ability to design and construct direct-fired heaters of exceptionally high heat-duty requirements. This specialized



experience can help you save time and expense in meeting your exact requirements for special heating and vaporization units. For full details on the 357,000,000 btu/hr units above, send for the Nov.-Dec. Heat Engineering. *Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.*

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

We Have a Mast to Meet Your Needs—whether it be deep work-over or drilling from 5,000 to 20,000 feet. Latest bulletins and engineering data on request.

You get all these outstanding benefits with

CONTINENTAL-EMSCO

MASTS

FOR EVERY DRILLING AND WORK-OVER NEED

1 - *Rear Leg Pivot and Ground Level Assembly*

The unit design of the mast, substructure and rear leg pivot makes assembly easy and safe and permits mast to be raised or lowered quickly.

2 - *Exceptional Visibility and Block Clearance*

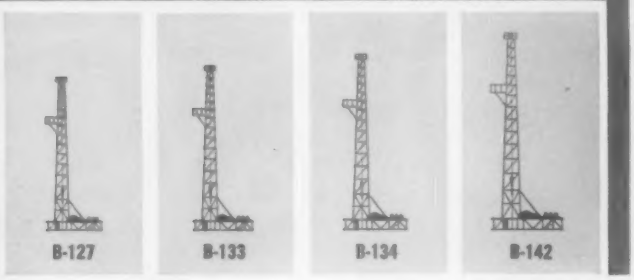
Open face design offers unusual visibility and makes possible fast operation of various size traveling blocks.

3 - *Pin Type Substructure and Mast*

Simplified pin connections for all mast sections speeds up assembly.

4 - *Maximum Portability*

Can be easily moved in one piece or knocked down into sections of roadable widths. Suited for barge installations and in oil fields everywhere.



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M-702

Users Say R/M BELTS AND HOSE

R/M *Poly-V*® Drive Puts New Push in Deep Hole Drilling!

No other belt can deliver as much power in as little space as R/M Poly-V. A *single, endless* V-ribbed belt runs on sheaves specially designed to mate precisely with the belt ribs. Uniform pull of the single unit belt gives higher horsepower capacity per inch of drive width than ever before possible. This patented new concept in heavy-duty power transmission delivers up to 50% more power in the *same* space as ordinary V-belt drives . . . *equal* power in as little as ⅔ the space!

The patented R/M Poly-V Drive meets the needs of today's deeper drilling operations . . . puts that extra power push behind a slush pump, to permit more rapid circulation of mud, faster drilling speeds and longer drill bit life. Eliminates the problem of matching multiple V-belts in the field and greatly increases the working life of both belts and sheaves. Just *two* cross sections of R/M Poly-V meet *every* power requirement — field inventories are reduced to a minimum!

Write for Bulletin #6638

*Poly-V is a registered Raybestos-Manhattan trademark.

. . . And For "The Smoothest Running V-Belts Made," Specify CONDOR and R/M SUPER-POWER V-BELTS

Give You "*More Use per Dollar*"

Ray-Man Rotary Hose Handles Easiest on the Rig

. . . and *safest*, too. R/M's method of applying high tensile steel cable wires under precisioned tension makes Ray-Man CBL Rotary Hose unequalled for strength, flexibility and safety. It holds steady in the derrick without whipping . . . even under the high-pressures of deep drilling. And when it comes to moving from location to location Ray-Man's flexibility and light weight minimizes the dangers of accidental crushing and kinking in transport . . . assures easier, faster rigging up on the next job.

Ray-Man's streamlined, built-in coupling adds to your safety on the job, too. Designed without protruding lugs or flanges that cause fouling, it features R/M's special leak-proof "Lip-Lok" seal that actually tightens under pressure to prevent dangerous — and costly — blow-outs!

Add Manhattan's oil-proof tube for drilling-in with oil or oil-base and you've got easier, safer handling and longer, trouble-free services at less cost on *every* drilling job . . . with Ray-Man CBL Rotary Hose.

Write for Bulletin #6743 for details

There's an R/M Hose For Every Oil Field Use!

You'll find "More Use per Dollar" features in these R/M hose constructions, developed especially for oil field service:

Manhattan Mud Pump Intake Hose — designed with Type 'C' Leakless Built-In Nipples for rough service with the most powerful mud pumps.

Manhattan Geophysical Hose — dependable strength, longer service in drilling small test wells.

Ray-Man Rotary Vibration Hose — to withstand high pressures between mud pump and rig standpipe.

Discuss your hose needs with an R/M representative.

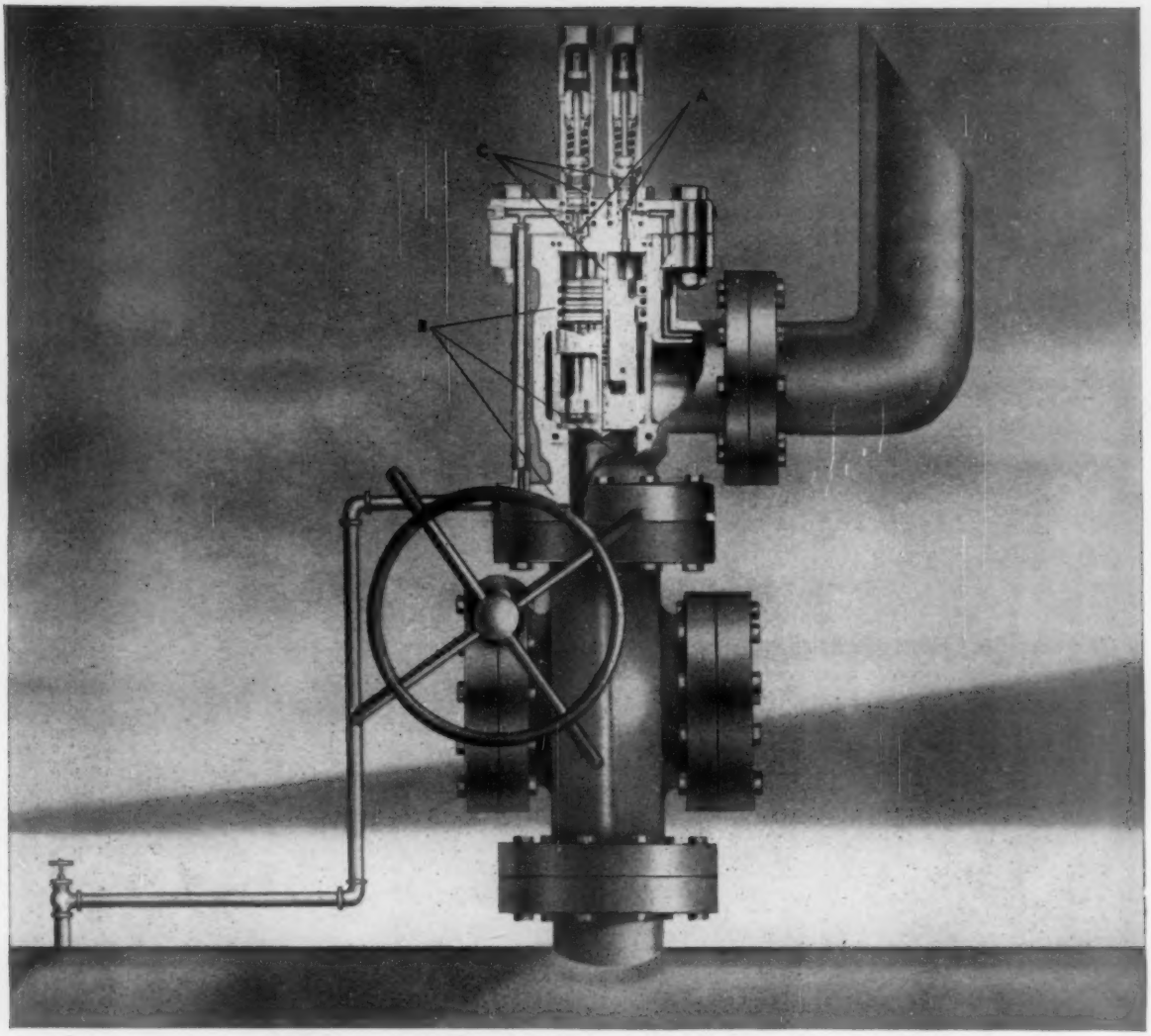
RM 721

BELTS • HOSE • ROLL COVERING • TANK LININGS • INDUSTRIAL RUBBER SPECIALTIES

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products: Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls



This "Type D" valve responds to changes as low as 1% of system pressure over unlimited cycles. For information write Garrett Oil Tools, Inc., P.O. Box 2427, Longview, Texas.

How Monel improves Garrett pressure relief valves

A. Critical control surfaces: Monel alloy helps preserve their dimensional accuracy despite corrosive and erosive attack.

B. Pressure structure: Monel alloy provides high basic strength, prevents untimely weakening from metal loss due to corrosion.

C. Working parts: Monel alloy withstands wear, impact, and other mechanical forms of trouble.

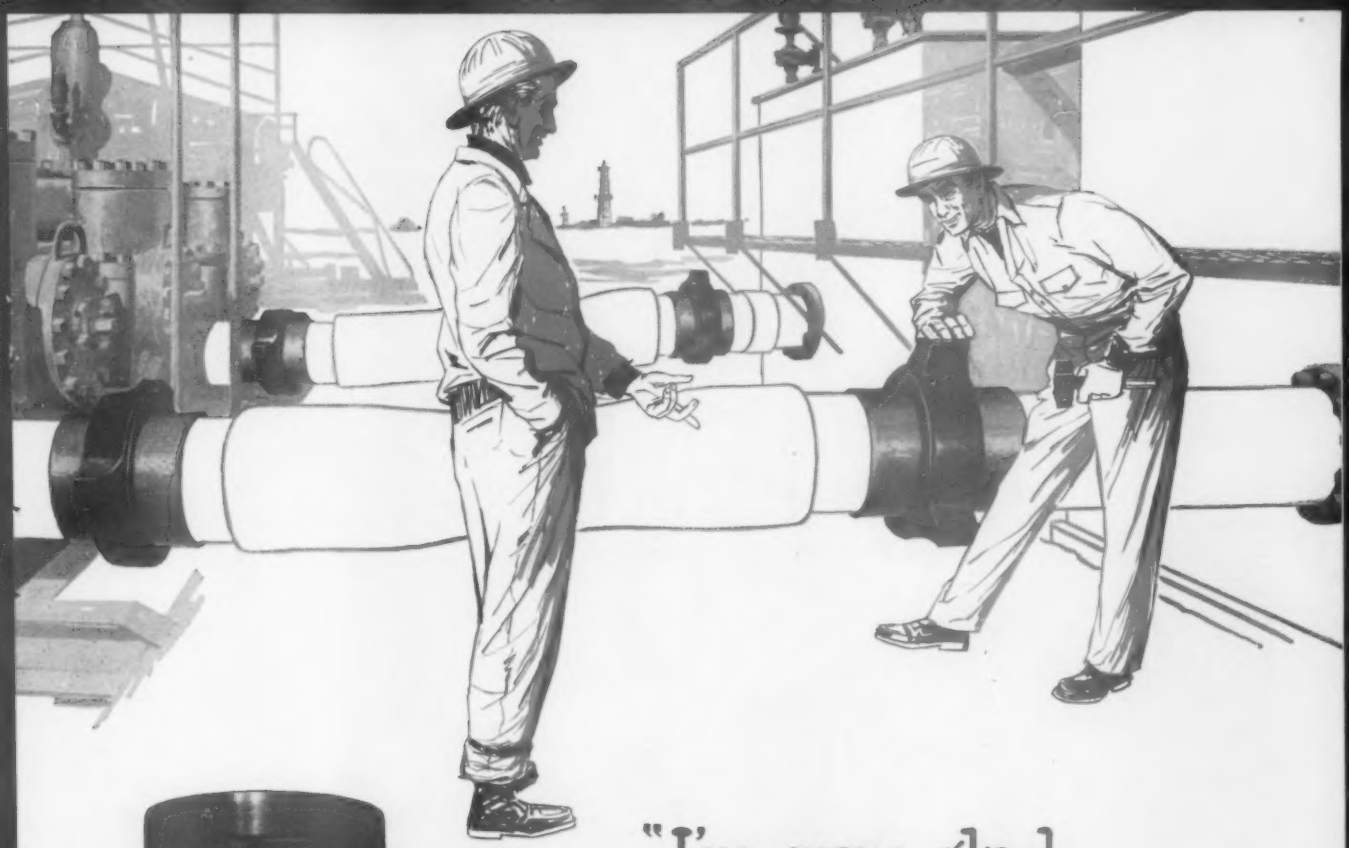
With Monel* nickel-copper alloy, Garrett high-pressure relief valves operate reliably even in remote locations where frequent maintenance is impractical. Monel withstands fast-moving and "sour" gases in the stream.

Monel and other Inco Nickel alloys are used in thousands of locations and many different types of drilling, producing and refining equipment. *They have proven uniquely resistant to corrosion, and well able to meet a wide range of severe physical requirements.* For assistance in their application, contact Inco's Development and Research Division.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK **NICKEL ALLOYS**

*Registered trademark



"I'm sure glad we've standardized on WECO unions!"

Standardization with Weco saves the time and trouble of searching for unions that match and mate when you rig up. The interchangeability of unions in the same size and pressure rating eliminates the replacement of complete unions . . . assures perfect leak-proof protection on all rig connections.

When you fully appreciate how much time and expense you can save, you will agree that it is wise to standardize with Weco Unions.

U-7-56

WECO®

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of*
FOOD MACHINERY AND CHEMICAL CORPORATION

PESA

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FOOD MACHINERY AND CHEMICAL CORPORATION

call your "shots"

WITH HALLIBURTON

RTTS PACKER

(RETRIEVABLE TEST-TREAT-SQUEEZE)

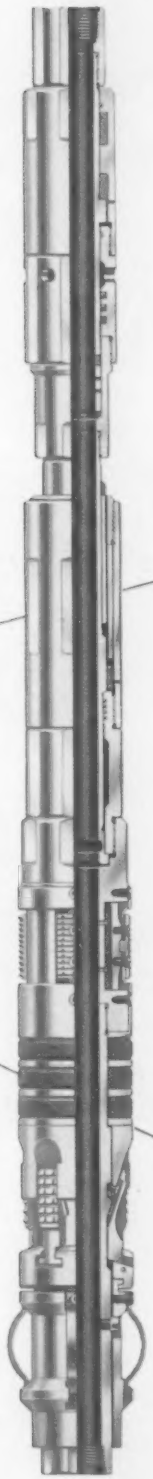
FOR TESTING
SQUEEZE CEMENTING
CHEMICAL TREATING
FRACTURING

The complexity and variety of modern techniques for well conditions and remedial operations no longer require a truck-full of specialized tools and the time it takes for special make-ups and round-trips for each operation. Halliburton eliminates time and money consuming roundtrips, cuts down rig time and gets four vital operations done quickly and effectively ... in *one* trip in and with *one* tool ... the Halliburton RTTS Packer.

This versatile, full opening tool saves you time and money on these vital Halliburton services:

1. Testing 2. Gun Perforating 3. Squeeze Cementing 4. Chemical Treating 5. Fracturing

Here's another example of how Halliburton's integrated services get you more in ultimate recovery ... for your money. One trip to the well ... *one* equipment set-up ... *one* trip in brings you complete service with just *one* call to the local or district office or a letter or wire to the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.



A Halliburton service crew, equipped with a Halliburton RTTS Packer, can perform a whole series of "first aid" operations on the spot. For example, a tubing-type perforating gun can be run to open up a producing zone. While still in the hole, the well can be tested. This can be followed by chemical treatments to remove plugs from formation channels to provide for more effective fracturing. Then, fracturing fluids best suited to particular well and formation conditions can be pumped in. Cementing techniques may be applied to shut off water zones and seal off unwanted migratory fluids.

This unique, retrievable packer is operated by simple tubing manipulation. It combines ruggedness for testing operations, full-opening mandrel for treating with large fluid volumes and for passage of tubing-type perforating gun and a safety joint with drillability features required for squeezing cement. A full opening tubing testing device is also provided.

In versatility and in practical operation, Halliburton's RTTS Packer is the equivalent of 4 tools at the price of 1!

Ask for the new "RTTS" Bulletin

HALLIBURTON CEMENTING SERVICES

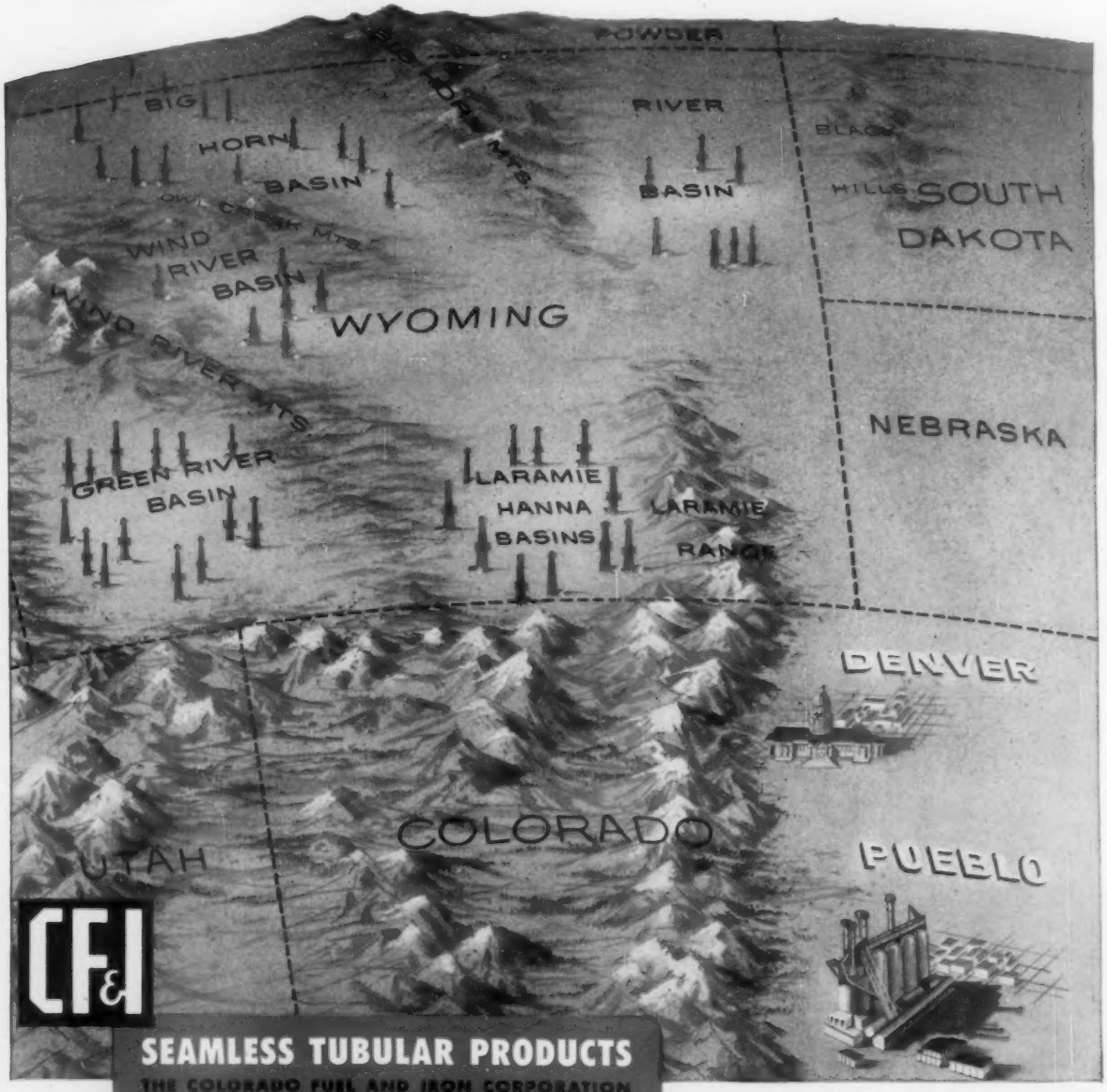
251 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

you'll find
CF&I SEAMLESS CASING AND TUBING
throughout the Wyoming basins

Today, CF&I Seamless Oil Country Casing and Tubing is serving operators throughout Wyoming's Big Horn, Green River, Laramie-Hanna, Powder River and Wind River Basins—just as it is serving other oil field operators all over the West.

Why such popularity? The answer is *quality*—quality that assures each operator that CF&I's conveniently located Seamless Tube Mill offers them casing and tubing manufactured for maximum service.

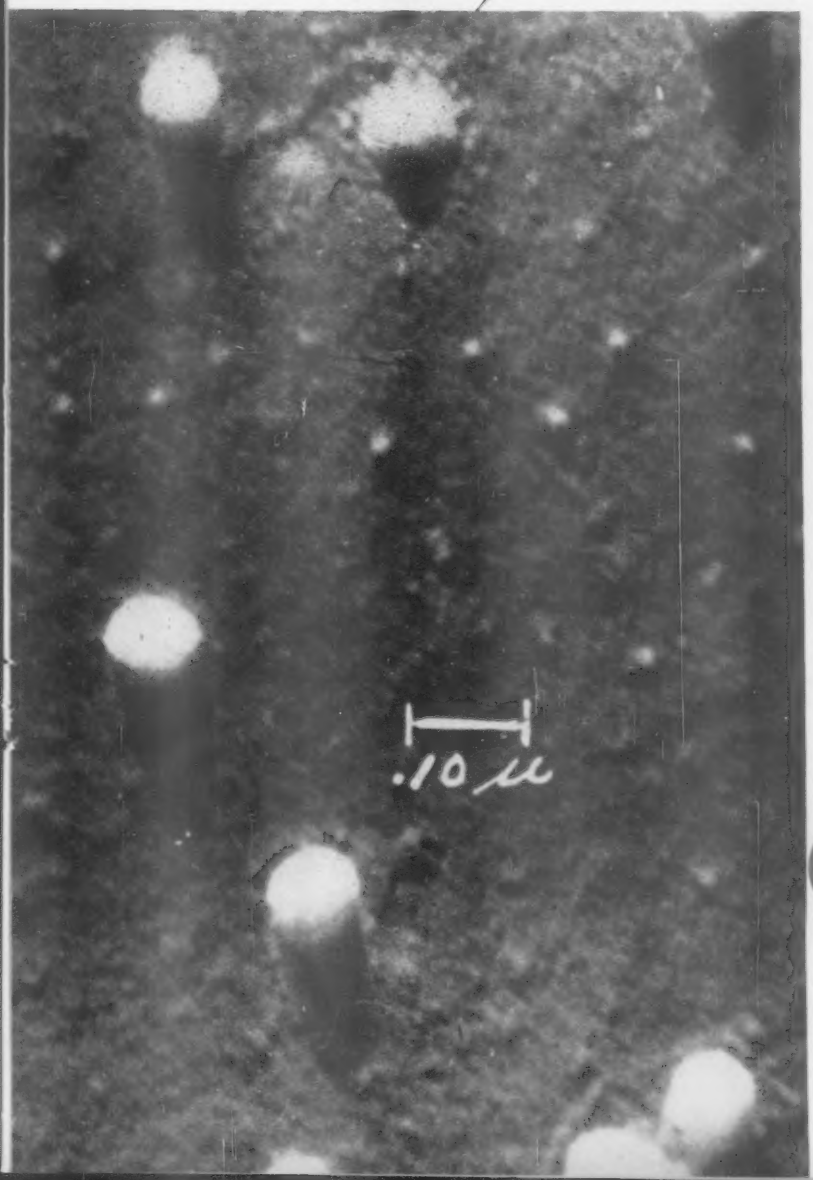
It will pay you to specify *CF&I* Seamless Oil Country Casing and Tubing. Available in 2⅜" through 9⅝" O.D., this dependable product meets or exceeds API STD 5A specification. See your CF&I representative today for complete details.



4479

MEASURING THE UNSEEN

Influenza virus magnified 78,570 times by an electron microscope. The unit of measure shown, 0.1 μ, is 1/10,000 millimeter.



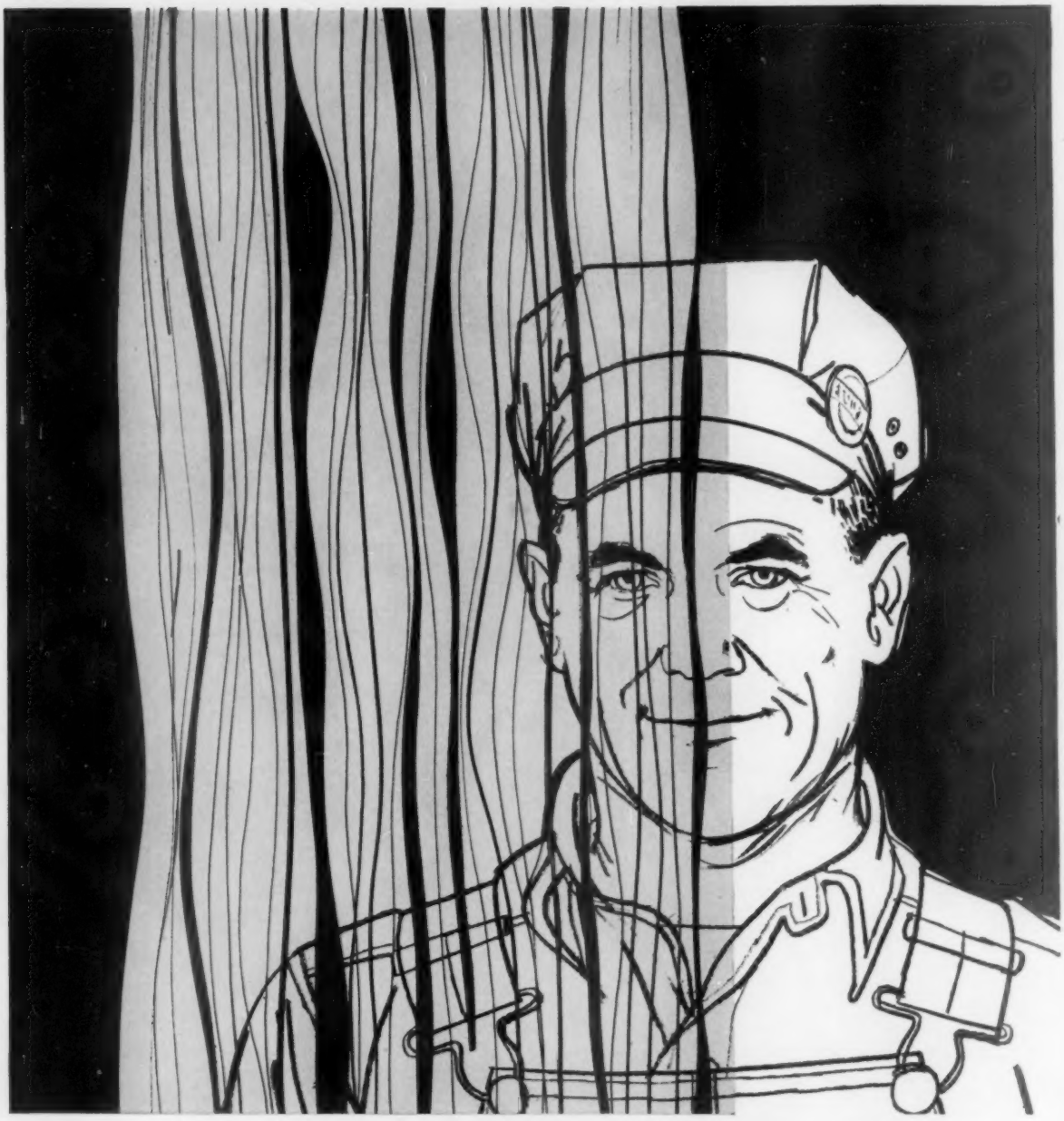
Tuboscope research in its field has been as imaginative and rewarding as the electron microscope has been in its field.

With instruments developed by Tuboscope research, Tuboscope technicians are able to measure the unseen ravages of wear, fatigue, and corrosion in oilfield tubular goods. These instruments, coupled with Tuboscope's years of experience, assure you of the best and the newest in proved methods of non-destructive inspection in the field.

The important elements of bottom hole temperature and pressure can likewise be measured by the Subsurface Engineering Division.

Tuboscope COMPANY

2919 HOLMES RD.
HOUSTON, TEXAS



SEEING EYES FOR SCULPTORS OF METAL

A BILLION battles take place daily as America's machine tool operators watch their super-hard precision cutting tools shape reluctant metal to industry's needs . . . with an accuracy as close as one ten-thousandth of an inch.

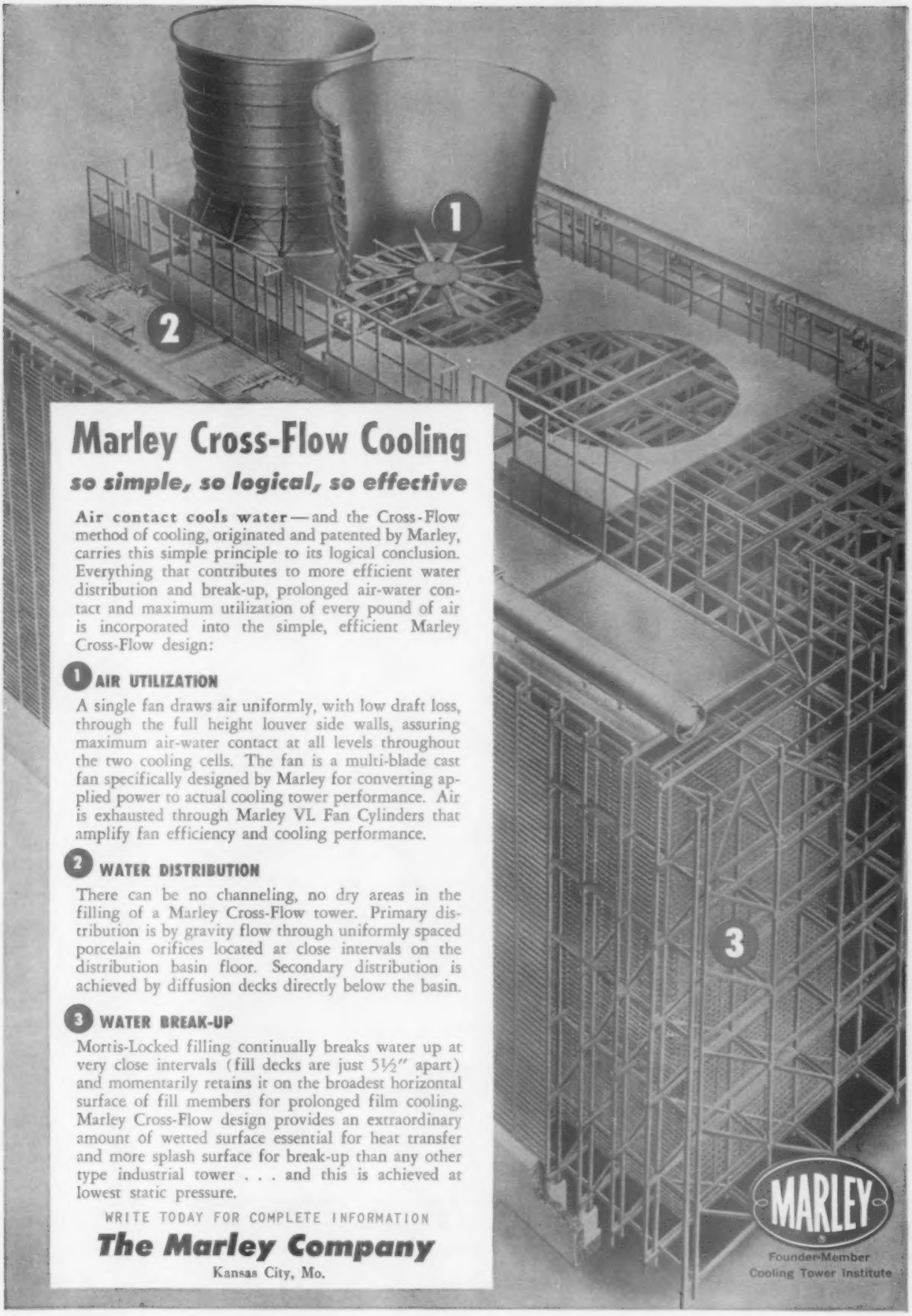
Oil carries away the heat of these battles . . . flowing constantly over the friction-heated cutting tools to save them from destruction.

Here Texaco Research has made a vital contribution. Once all cutting oil was opaque. The operator could not see his work. Then Texaco developed the first *transparent* cutting oil. Now the machinist could *see* the tools in operation, control them with greater accuracy, guard against the waste of imperfect workmanship.

Texaco Research has scored "firsts" in many fields. Its highly-developed manpower and facilities work in many ways to serve all industry everywhere.

THE TEXAS COMPANY

TEXACO RESEARCH— always ahead



Marley Cross-Flow Cooling

so simple, so logical, so effective

Air contact cools water—and the Cross-Flow method of cooling, originated and patented by Marley, carries this simple principle to its logical conclusion. Everything that contributes to more efficient water distribution and break-up, prolonged air-water contact and maximum utilization of every pound of air is incorporated into the simple, efficient Marley Cross-Flow design:

1 AIR UTILIZATION

A single fan draws air uniformly, with low draft loss, through the full height louver side walls, assuring maximum air-water contact at all levels throughout the two cooling cells. The fan is a multi-blade cast fan specifically designed by Marley for converting applied power to actual cooling tower performance. Air is exhausted through Marley VL Fan Cylinders that amplify fan efficiency and cooling performance.

2 WATER DISTRIBUTION

There can be no channeling, no dry areas in the filling of a Marley Cross-Flow tower. Primary distribution is by gravity flow through uniformly spaced porcelain orifices located at close intervals on the distribution basin floor. Secondary distribution is achieved by diffusion decks directly below the basin.

3 WATER BREAK-UP

Mortis-Locked filling continually breaks water up at very close intervals (fill decks are just 5½" apart) and momentarily retains it on the broadest horizontal surface of fill members for prolonged film cooling. Marley Cross-Flow design provides an extraordinary amount of wetted surface essential for heat transfer and more splash surface for break-up than any other type industrial tower . . . and this is achieved at lowest static pressure.

WRITE TODAY FOR COMPLETE INFORMATION

The Marley Company

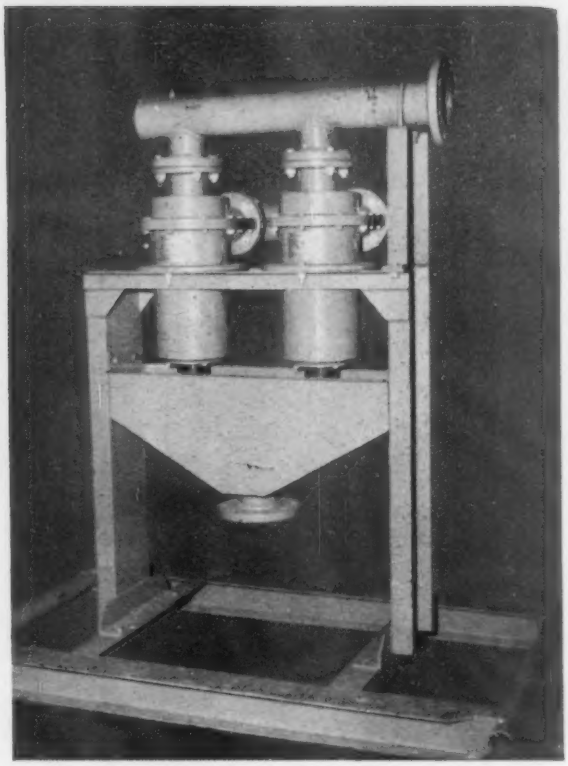
Kansas City, Mo.

MARLEY

Founder-Member
Cooling Tower Institute

HERE IT IS...
a new 2-DorrClone
Dorrco
D-Sander

—designed especially for hard formation drilling



The new Size 2 Dorrco D-Sander is low in both first cost and operating cost. In addition, it is light in weight and easy to move. Designed especially for hard formation drilling with any rig, or slim hole drilling in a wide variety of formations, it brings the benefits of drilling fluids substantially free of drilled solids within the reach of every operator.

The benefits from using Dorrco D-Sanders are many. In many fields along the Gulf Coast, as well as other areas, abrasive sand can seriously reduce the life of bits and pump parts unless a D-Sander is used. In addition, the high viscosity of mud laden with drilled solids reduces drilling rates as much as 25 per cent.

In these areas, important savings in drilling costs result in that section of the hole where unweighted mud can be used.

But recent experience has proved that savings can also be realized in many other areas where abrasive formations are not encountered. In these areas, "flour sand" Dorrco D-Sanders, set to remove all drilled solids above 30 microns in size, result in greatly improved drilling speeds—sometimes in excess of 15 per cent.

In harder formations, drilling rates are slower and drilled solids are produced at a lower rate. In many of these areas, the Size 2 D-Sander, which provides capacities up to 250 gpm, is entirely adequate, yet it costs less to buy, to move and to operate than larger units.

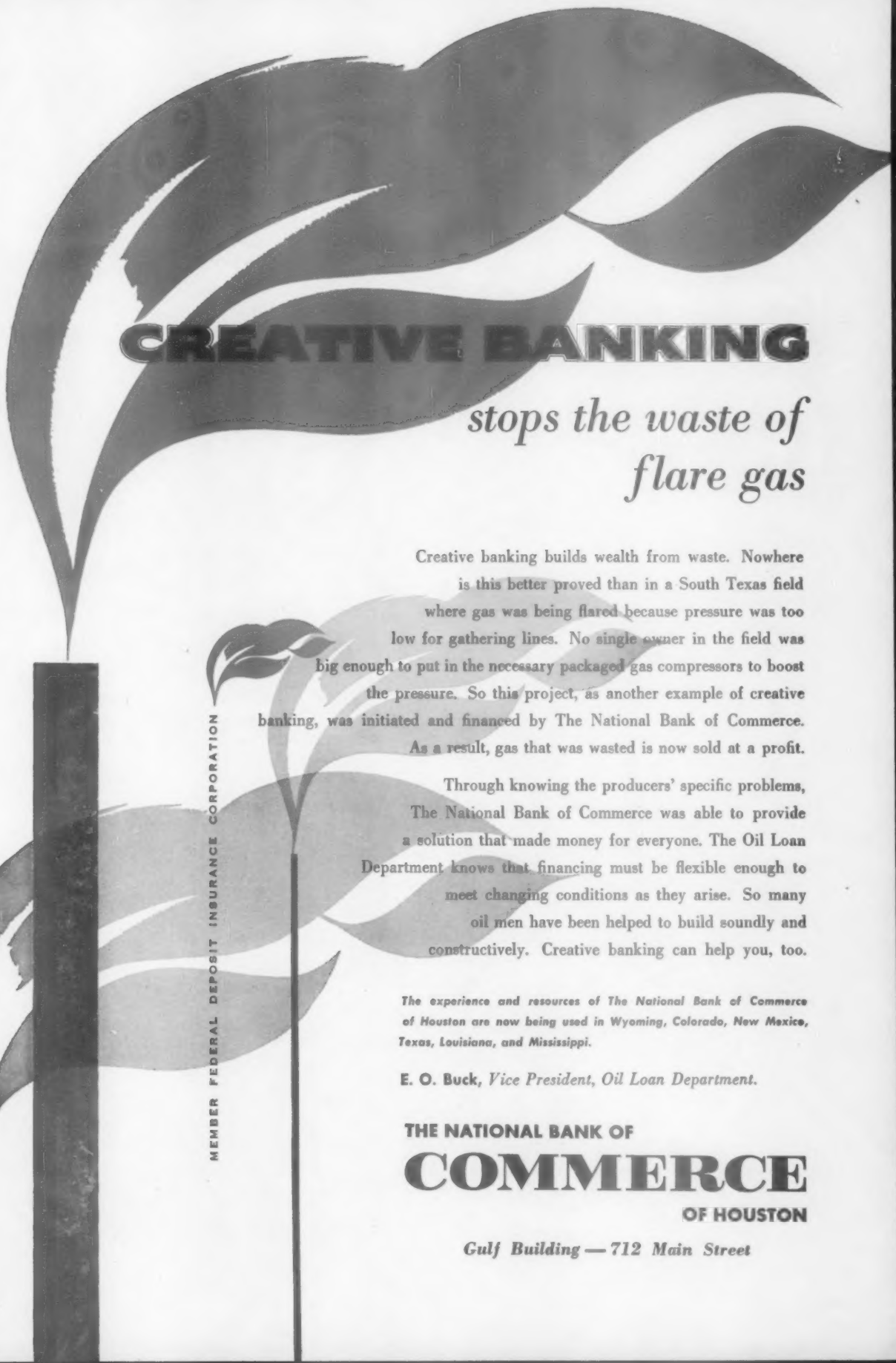
The new Size 2 D-Sander compliments the capacity ranges of the larger sizes 4 and 6. With this new addition, Swaco offers units suitable for any rig and any drilling condition. Write for full information.

SWACO

SALT WATER CONTROL Inc.

A Sid Richardson Development Company

1211 Ft. Worth National Bank Phone: ED 2-4434 Ft. Worth, Texas



CREATIVE BANKING

stops the waste of flare gas

Creative banking builds wealth from waste. Nowhere is this better proved than in a South Texas field where gas was being flared because pressure was too low for gathering lines. No single owner in the field was big enough to put in the necessary packaged gas compressors to boost the pressure. So this project, as another example of creative banking, was initiated and financed by The National Bank of Commerce. As a result, gas that was wasted is now sold at a profit.

Through knowing the producers' specific problems, The National Bank of Commerce was able to provide a solution that made money for everyone. The Oil Loan Department knows that financing must be flexible enough to meet changing conditions as they arise. So many oil men have been helped to build soundly and constructively. Creative banking can help you, too.

The experience and resources of The National Bank of Commerce of Houston are now being used in Wyoming, Colorado, New Mexico, Texas, Louisiana, and Mississippi.

E. O. Buck, *Vice President, Oil Loan Department.*

THE NATIONAL BANK OF

COMMERCE

OF HOUSTON

Gulf Building — 712 Main Street

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

Roebling Royal Blue Wire Rope will **wear** and **wear** and **wear**!

This working quality means longer service life on *your* job. Add to this the fact that Royal Blue is stronger than the strongest rope you have been using and you have two excellent reasons why it has enjoyed faster acceptance than any wire rope in Roebling's history. Your distributor or Roebling Sales Office will give you the complete story, or contact John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Distributors, Branches and Warehouses Throughout the Country—Subsidiary of The Colorado Fuel and Iron Corporation

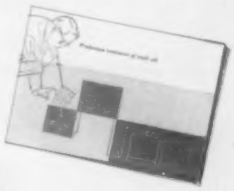
EXTRA SERVICE on the lease cuts your demulsification costs . . .

There's only one place to find out how best to treat your crude to meet pipeline requirements. And that's right on the lease.

There's only one way to dig out the most effective demulsifier to treat at lowest cost. And that's by sticking with the job, testing and re-testing, until the one best answer comes out.

This is the way Aquaness field men work for you. They come to your lease equipped with a wealth of experience in emulsion breaking methods and materials . . . a mobile laboratory that enables them to test thoroughly and compare results on the spot . . . and a complete line of high-uniformity treatment chemicals that they can use in hundreds of combinations to fit your specific emulsion problems.

Aquaness men have a reputation for thoroughness. They're never satisfied until they work out the *one* best demulsifier that will give *you* the best results at lowest cost. For a test on your production, call your local Aquaness man . . . located at strategic spots throughout oil producing fields.



Write for the new Aquaness booklet, "Production Treatment of Crude Oil."

ATLAS

Aquaness
Department
ATLAS POWDER COMPANY
2005 Quitman Street, Houston 26, Texas

RECTOR type "M"

..the Tubing Head that's WAY ahead

..in Flexibility

MANDREL HANGERS

Type "A" Mandrel Hanger threaded for EUE or regular tubing.

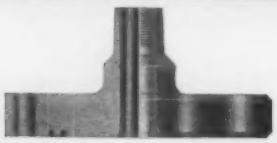
Type "M" Stripper for tubing heads with locking screws.

Type "A-O" Mandrel Hanger threaded, also grooved for locking screws. The "O" Ring serves as temporary seal.

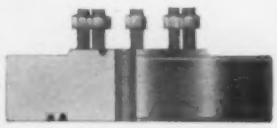
Type "WM" Wrap-Around Mandrel. It is hinged to wrap around tubing; also grooved for locking screws.

Type "C" "Slick Joint" Mandrel grooved for locking screws. The "O" Ring serves as temporary seal.

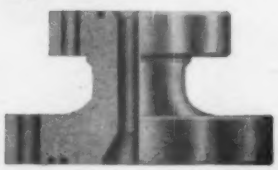
BONNETS



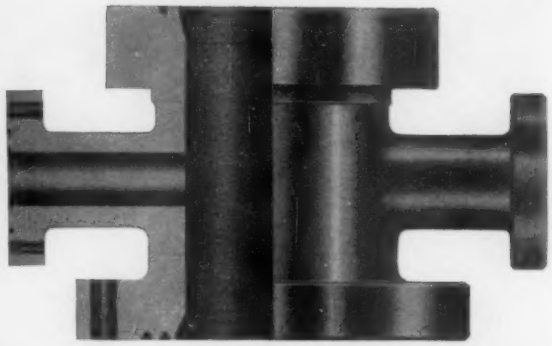
Male threaded bonnet also available with underside female threaded to hang tubing.



Studded bonnet also available with underside female threaded to hang tubing.



Spool-type bonnet also available with underside female threaded to hang tubing.



The wide range of body types (6), the complete range of pressures (2,000 to 15,000 lb. test), the variety of mandrel hangers and bonnets (10) . . . all of which are interchangeable in the bodies, plus auxiliary equipment, make it possible to select a Rector Type "M" Tubing Head for every well completion condition and preference.

Every one of these heads employs the proven Rector principle of sealing with steel . . . a single API Ring Gasket acting dually as seal and hanger hold-down. There are no soft or resilient seals in these heads to deterioriate, burn out, freeze or contract in extremely low temperatures.

When planning well completions . . . specifying Christmas Trees . . . specify a Rector Type "M" Tubing Head for the utmost in safety and flexibility.

For complete specifications of all Type "M" Tubing Heads, Mandrels and Bonnets, see the Composite Catalog.

RECTOR WELL EQUIPMENT COMPANY INC

★ MAKING THE OIL INDUSTRY SAFER

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Houston Plant: 2215 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

DEPENDABILITY

...EVEN WITHOUT STANDBY...
WITH RCA MICROWAVE

IN VITAL 2-SYSTEM OPERATION AT EL PASO NATURAL GAS CO.

The dependability and flexibility of RCA CW-20 Microwave equipment have been demonstrated at El Paso Natural Gas Co. An original 290-mile pipeline installation in Texas, in 1953, has more recently been augmented by a newer 475-mile system in western Texas and New Mexico . . . achieved with a minimum of expense.

According to the Superintendent of Communications of El Paso Natural Gas Co., outage time has never been more than 1%—without standby and wholly without overtime maintenance. In addition, it has been possible to rearrange the systems to fit new requirements as they arise.

The original installation with short-haul leg circuits was used for voice channels and telemetering. Because of its reliability, additional channels were added, and RCA Equipment was chosen for the second installation.

Routes of El Paso Natural Gas Co.'s pipeline microwave systems in mountainous regions of Texas and New Mexico, and (below) microwave antennas on mountain.

RCA MICROWAVE assures the most advanced engineering features. Provision for the addition of future channels makes it the least expensive form of communication per channel mile. Equipment utilizes easy-to-service familiar circuits and conventional tubes. Single side-band suppressed carrier frequency division multiplexing is used exclusively to meet high standards of dependability. Frequency is controlled only from the terminals through the entire system. Furthermore, RCA provides the nation-wide services of the RCA Service Company to keep entire system operating at its peak.

RCA Microwave Specialists will be glad to answer any questions and help plan your installation. Mail coupon for further particulars on use of Microwave in utilities, pipelines, turnpike and other applications.

RCA MICROWAVE
POINT-TO-POINT COMMUNICATION

RCA

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CAMDEN, N.J.

Radio Corporation of America
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Please send me latest literature on RCA Microwave.
☐ Have an RCA representative contact me.

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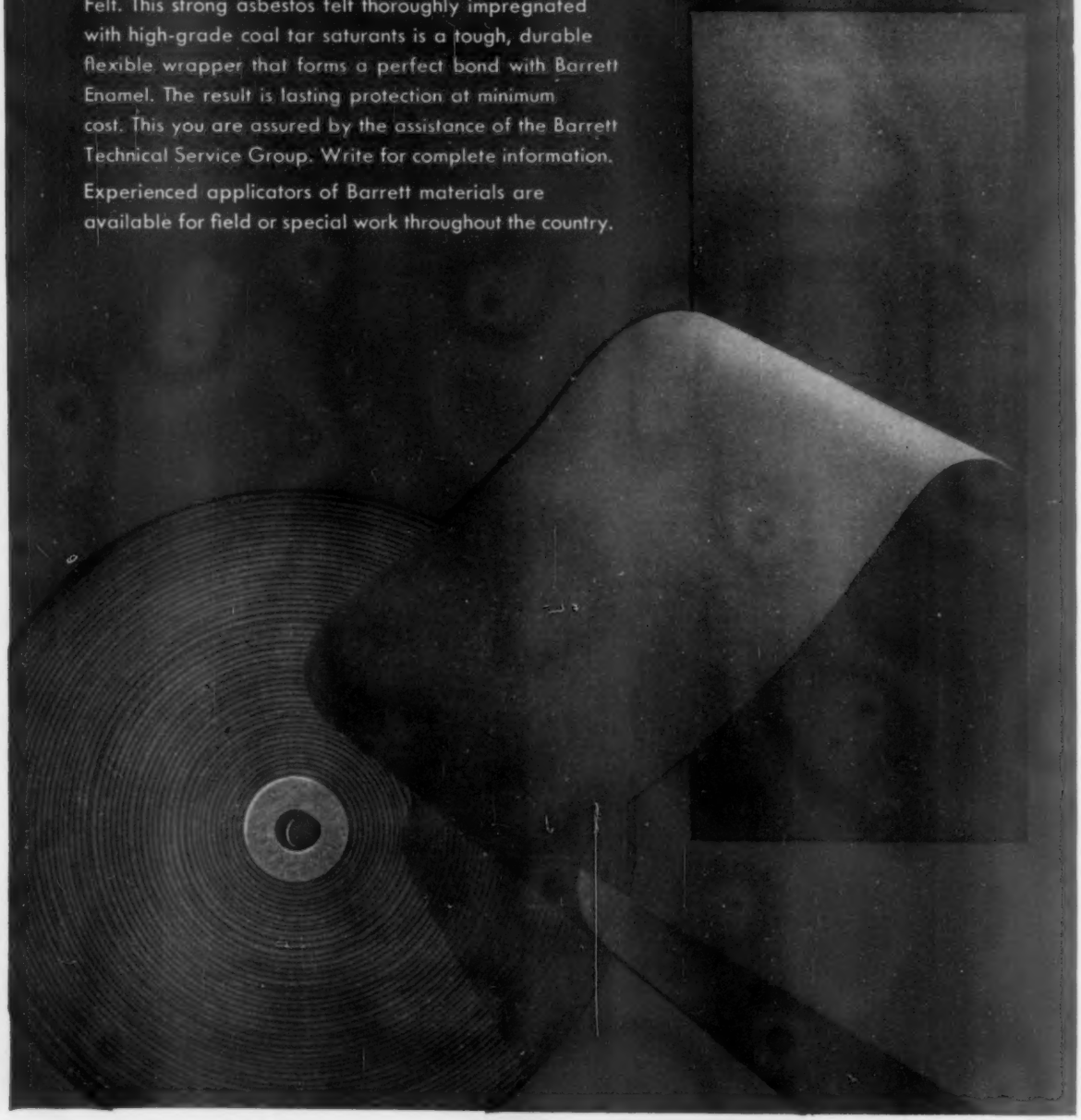
ALL-AROUND PROTECTION

You get all-around pipe protection with Barrett Pipeline Felt. This strong asbestos felt thoroughly impregnated with high-grade coal tar saturants is a tough, durable flexible wrapper that forms a perfect bond with Barrett Enamel. The result is lasting protection at minimum cost. This you are assured by the assistance of the Barrett Technical Service Group. Write for complete information.

Experienced applicators of Barrett materials are available for field or special work throughout the country.



Barrett®

PROTECTIVE COATINGS

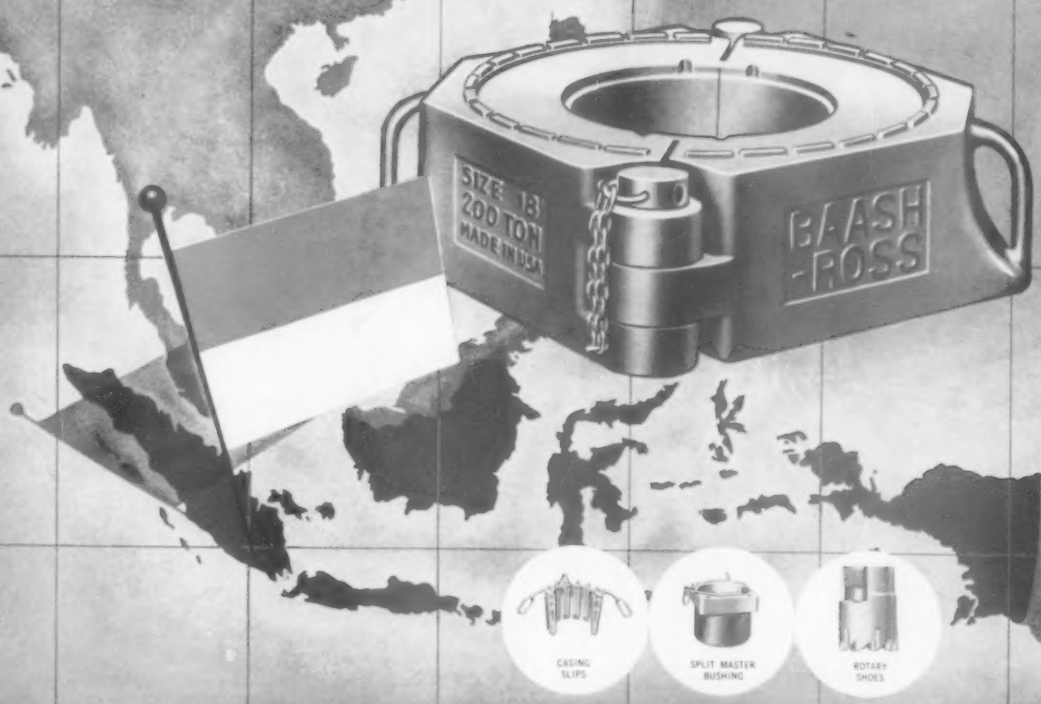
BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector St., N. Y. 6, N. Y. In Canada: The Barrett Company, Ltd., 5551 St. Hubert Street, Montreal, Que.

OVER 100 YEARS OF EXPERIENCE

Allied Chemical

over 3,000 wells drilled in Indonesia used tools by

BAASH*ROSS



CASING SLIPS

SPLIT MASTER BUSHING

ROTARY SHOES

here's how Baash-Ross

HINGED CASING SPIDER

simplifies your casing operation...

UNIVERSAL in its ability to meet any type of casing handling and is ideal for running wash-over strings.

INTERCHANGEABLE bushings provide wide choice of slips. Rotary — casing — and others.

ONE OR BOTH pins can be removed for easy handling and convenient transportation.

CAN BE PLACED on cribbing . . . or on any rotary table . . . or in place of it.

For further information write P.O. Box 1348, Houston 1, Texas or see The Composite Catalog.

The BAASH-ROSS HINGED CASING SPIDER can be used in many ways and it is particularly adaptable in running casing when (1) the casing will not pass through the rotary table; (2) accessory production on cementing equipment will not clear a closed spider or the rotary table; or (3) where it is preferred not to place a heavy casing string load on the rotary table bearings. Buy through your supply store.

BAASH ROSS
TOOL COMPANY
DIVISION OF JOY MANUFACTURING COMPANY

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CANTON, OHIO • NEW YORK, NEW YORK • OLNEY, ILLINOIS • FARMINGTON, NEW MEXICO
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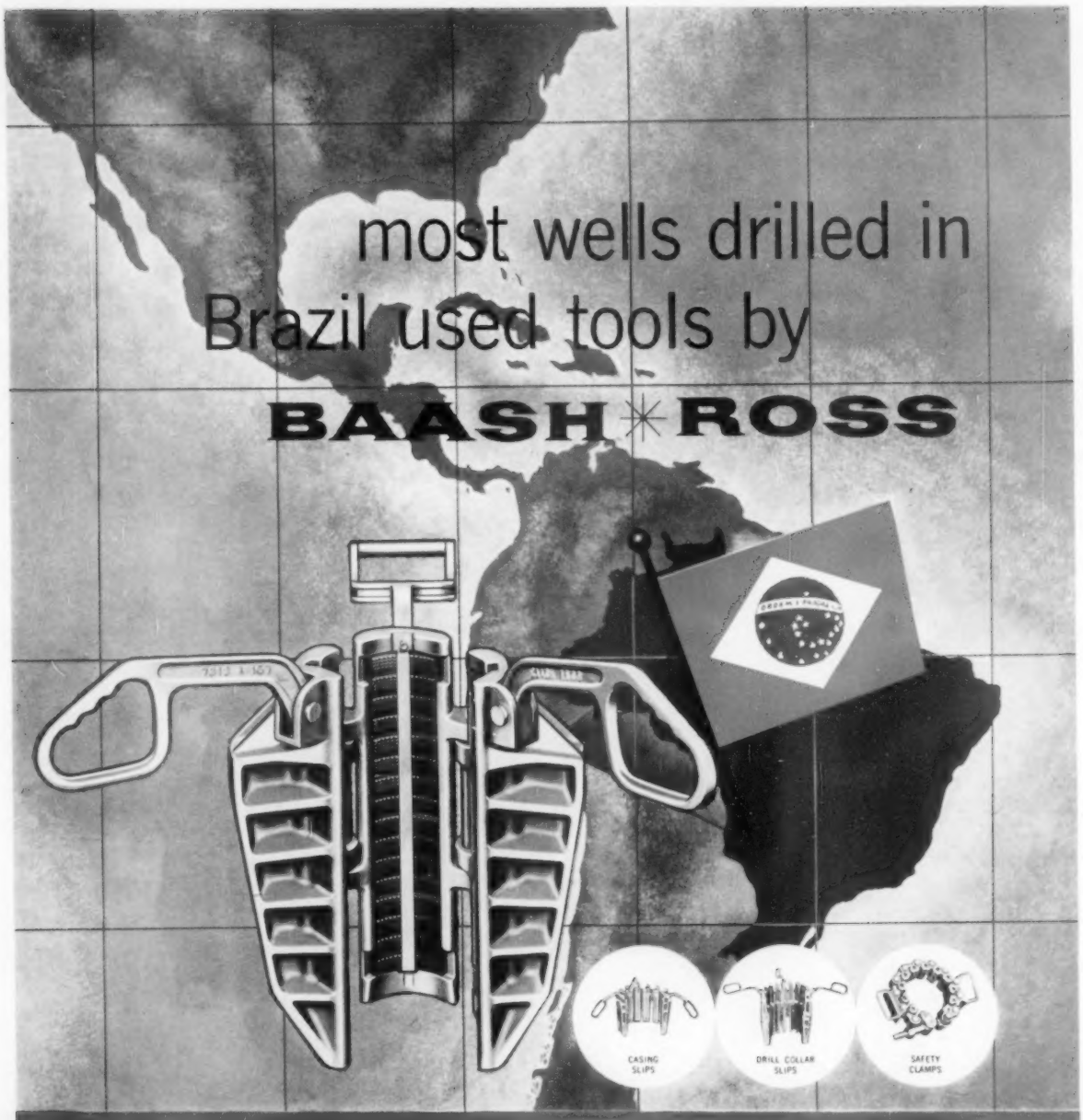
MEXICO, D.F. • GRENNOCK, SCOTLAND



Baash-Ross

"DU" ROTARY SLIPS

are outstanding because...

FLEXIBLE-HINGED unitized design insures a uniform, full-circumferential grip on every setting.

SEGMENTED LINERS are easy to replace and are used on both "Regular" and "Long" bodies—give a safe grip that will not damage pipe.

THREE BODY SIZES fit wide range of pipe sizes—2⅜" to 7"—by simply changing liners.

AVAILABLE for all types and sizes of rotary tables.

For further information write P.O. Box 1948, Houston 1, Texas or see The Composite Catalog.

BAASH-ROSS TYPE "DU" ROTARY SLIPS are the most advanced slips available. Their wide range of adaptability is unsurpassed. Because of their unusually light weight and balanced design, crew fatigue is greatly minimized. The unique segmented liners reduce both maintenance and inventory cost—an ideal combination. Stocked at *your* supply store.

BAASH ✳ ROSS
TOOL COMPANY
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Quick coupled temporary lines of Alcoa Aluminum Pipe lay fast to save money. High reclaim value makes aluminum lines cost still less in terms of service. In many applications, pick-up and relaying is possible almost without limit.

Cut pipe laying costs over 77%

with ALCOA Aluminum Pipe—available in quantity for oil country service

The figures at right compare actual laying time and costs for 3 miles of 2½" quick coupled aluminum pipe and the same length of 2½" steel pipe. Similar cost comparisons apply to other pipe sizes. Here is dramatic evidence that you can cut pipe laying costs by over 77% when you specify light yet strong and durable ALCOA® Aluminum Pipe for oil country service. Happily, that's just part of the economy story.

The long service life and high reclaim value of ALCOA Aluminum Pipe bring still lower its actual cost-per-foot in service. The natural corrosion resistance of aluminum keeps it in service long after other types of pipe would fail. It requires only reasonable care in installation and operation. Its inherent strength and durability permit stringing it almost anywhere without costly tool forming or joint assembly.

First to work with aluminum pipe in the petroleum industry, Alcoa installed the original aluminum pipeline in 1948. That pioneering has proved that ALCOA Aluminum Pipe can be laid economically and offers a highly practical solution to many oil country pipelining problems . . . for lowest installation costs, operating-maintenance economies and long, satisfactory service. Get complete details in the FREE BOOKLETS, *Alcoa Aluminum Pipe for Oil Country Service* and *Alcoa Aluminum Pipe and Fittings*. Use the coupon below, or write ALUMINUM COMPANY OF AMERICA, 921-C Alcoa Building, Pittsburgh 19, Pennsylvania.

READY AVAILABILITY—ALCOA Aluminum Pipe for oil country service is available in quantity, in a wide range of diameters and wall thicknesses, from major oil field supply houses throughout the producing areas. Quick couplings of aluminum are available from several manufacturers through the same supply houses. Check the Yellow Pages of your telephone directory for your nearest ALCOA sales office or oil field supply house.

Comparative Installation Time and Costs for 3 Miles of 2½" Pipe with Quick Couplings

	Aluminum-Schedule 5		Steel-Schedule 40-Screwed
Crew Size	3	5	5
Man-hours	27	35	120
Man-hours Saved, $	93	85	
% Man-hours, Aluminum vs. Steel	22.50	29.00	—
Trucks Employed	1	1	2

Permanent welded lines of Alcoa Aluminum Pipe also make possible valuable laying cost economies. Add to that the long service life and immediate availability of Alcoa Aluminum Pipe . . . and it clearly becomes the most practical, economical solution to many pipelining problems.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

Aluminum Company of America
921-C Alcoa Building, Pittsburgh 19, Pa.

Send me the FREE BOOKLET

- ☐ Alcoa Aluminum Pipe for Oil Country Service
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My pipelining problem is_____

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

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"Wherever there's oil you'll find Baird products on the job."

Always Available Through Your Supply Store

Baird

MANUFACTURING COMPANY
P. O. Box 380
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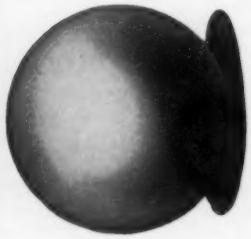
For best service use the right Baird ball with the right Baird seat.

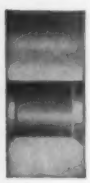
"Sheralloy" Ball
Excellent to combat corrosion and hard enough for deep pumping. Non-magnetic.

"Ceramic" Ball
Nearly as hard as a diamond. Non-corrosive and non-magnetic.

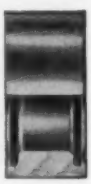
"Stainless Steel" Ball
For ordinary pumping where little trouble is encountered.



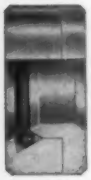
"Single Seal" Seat
A competitively priced stainless steel seat for routine pumping.



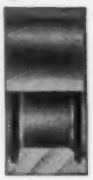
"Double Seal" Seat
For harder than usual pumping — double contact with the ball.



"O-Ring Seat"
A 2-piece stainless steel seat specially recommended where ordinary or fracturing sand is causing seat failures.



"Sheralloy" Seat
A cast alloy definitely proved resistant to corrosion. Also good for hard pumping.



They Say—

Price Increase Byproduct

"At this moment, legislatures of the Rocky Mountain states are actively exploring new ways and means of securing revenue for education and the highway construction program that lies ahead . . . the crude oil price increase within itself, without additional taxation, would yield the Rocky Mountain states of Montana, Wyoming, and Colorado nearly $1,500,000 more than last year from their federal and state lands. This is a rather important consideration to us and a boon to the citizens of the area.

W. H. CURRY

"The above figures are not to say that further increases would not also accrue to our several states by virtue of the increase in private royalties, advalorem tax values, (because oil is assessed at 100 per cent of its price), tribal Indian lands receiving income from oil and gas production, general sales taxes, and additional improvements in the general economy."

William H. Curry, president, Rocky Mountain Oil and Gas Association, in a statement before Senator Joseph C. O'Mahoney's committee now investigating Middle East Emergency Committee activities.

Crude-Oil Prices Lag Behind

"There have been just two over-all increases in the prices of domestic crude oil since December 1947. One, in the amount of 25 cents per barrel, took place in June, 1953, and the other in January, 1957.

"Since June 1953, line pipe and oil-well casing (alloy) prices have increased about 35 per cent. Oil-well casing (carbon) prices have gone up about 25 per cent and oil-field machinery more than 20 per cent. During this same period and including the January 1957, increase, crude-oil prices have increased less than 10 per cent.

"Oil-production employes have, for many years, been among the highest paid workers in American industry. Average hourly wages paid have increased 14.7 per cent since June 1953, and 61.3 per cent since December 1947, compared with respective in-

A silent partner
Is at work, too

Wise oilmen throughout the fields of Louisiana, Texas and Eastern New Mexico are taking in a new silent partner —super-saturated Ready-Made brine.

Their new partner is saving them money in workovers, completions, and drilling through salt sections.

Ready-Made brine is fully saturated and free of suspended solids. It won't hydrate shales and clays, and when used in drilling through salt sections, bit size holes are assured. Ready-Made brine is pure beyond the most rigid requirements. Because it is tank trucked directly to your location and made ready to use, it saves on costly time and labor involved in mixing sack salt and field water.

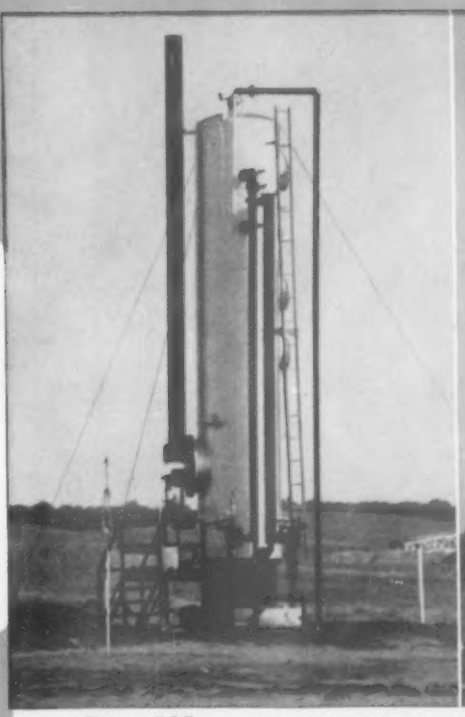
Call the ABI brine company nearest you and see how Ready-Made brine can save you time and money, too. With ABI you'll get three hour service wherever you are.

Associated Brine Industries

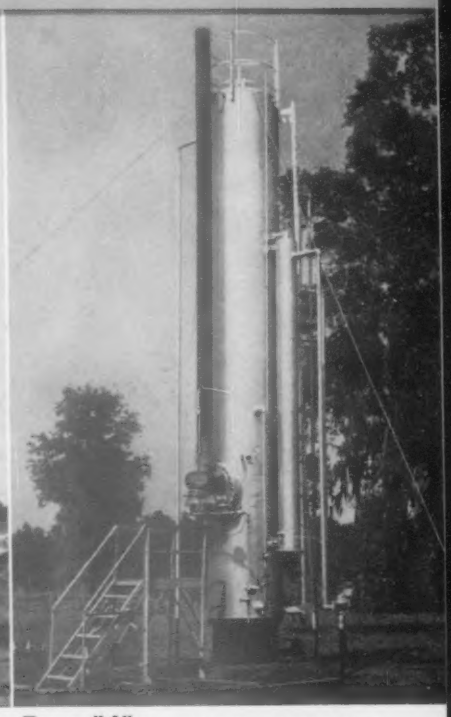
COMPANY	PRODUCING POINTS
Brine Service Div., Corpus Christi Salt Co	Beaumont, Tex.; Pine Prairie, La.
Brine Service Co.	Houston, Corpus Christi
Toland Brine Service, Inc.	Kermit, Tex.
The Brine Co.	Midland, Tex.; Hobbs, N. M.

For *Average* or *Tough* Treating Jobs...

BS&B Treaters Get The Job Done ...Right!



Type "S" The BS&B Type "S" Vertical Treater is a well balanced unit with excellent performance characteristics for low cost treating under average conditions. Available in sizes to treat 100 to 2500 bbls. of oil per day.



Type "J" The BS&B Type "J" Vertical Treater is a high performance level unit designed to handle large volumes of oil, water and gas on "tough" treating jobs. Available in sizes to treat 100 to 3600 bbls. of oil per day.

Model "HGT" Where a Horizontal Treater is indicated because of large volume requirements, broader distribution of weight on marshy ground, wind loading and anchoring conditions, etc. we strongly recommend the BS&B Model "HGT"." This treater will handle even the "toughest" treating jobs under the most adverse conditions. Available in sizes to treat 100 to 16,000 bbls. of oil per day.

Some makes and types of treaters operate at much higher efficiency than others under a given set of operating conditions. Some require a lot of expensive "down time" for maintenance and repairs. But lease operators of *experience* know that when they buy a BS&B Treater, they need have no concern on either count.

No matter how "average" or how "tough" the operating conditions on *your* lease, there's a right size and type of BS&B Treater for the job *you* have to do! BS&B Treaters are famous throughout the industry for their optimum operating results at lowest operating cost.

Don't be "shortchanged" by operating any treater on your lease that fails to deliver *maximum return per dollar invested!* Your BS&B Man will be glad to assist you in selecting the best treater for *your* conditions.

BLACK, SIVALLS & BRYSON, INC.

Oil & Gas Equipment Division, Dept. 1-A3

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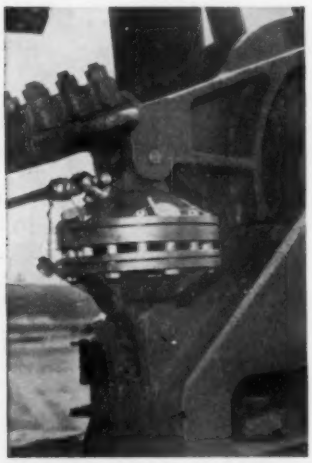
Martin-Decker's new Sensater gives you friction-free weight indication



The E-80 Sensater is a new kind of *diaphragm* pressure transformer. It doesn't deflect, but moves with its backing plate. The slightest movement of your Ideal Wire Line Anchor creates a piston-like stroke, without a friction-causing piston-rod or packing.

With the new ultra-perceptive Sensater, your Martin-Decker Type "D" or "E" Weight Indicator becomes a more valuable tool than ever for such precision jobs as fishing, milling, cutting, and coring — a small investment to increase the life of diamond bits and other costly equipment making up a half-million-dollar drilling rig.

The big color-keyed indicator dial instantly tells you the accurate weight of the drill string and the net weight on bit in thousands of pounds. Included is a vernier, sensitive to minor weight changes.

Martin-Decker's familiar red box is packed with valuable drilling information. The instrument panel includes a weight indicator, mud-pressure gauge, rotary torque gauge, draw-works speed selector, rotary-table tachometer, and a vapor-proof light. On the back is a 24-hour recorder with pens for weight, mud, and torque. Martin-Decker engineers will work out other instrument combinations for your special drilling requirements.

For further information ask for Bulletin P-10. Write: Martin-Decker, 3431 Cherry Ave., Long Beach 7, California, Dept. D-1.

DISTRIBUTORS: T. C. Cullen, Bakersfield, California; Reed Roller Bit Co., Houston, Texas; Reed Roller Bit Co. of Canada, Ltd., Calgary and Edmonton, Alberta. Martin-Decker Weight Indicators and Ideal Wire Line Anchors are also sold through The National Supply Co., The National Supply Co. Export Division and other recognized supply houses.

MARTIN-DECKER CORP.

HOME OF THE WEIGHT INDICATOR — LONG BEACH, CALIFORNIA

creases of 9.8 per cent and 21 per cent in crude oil prices."

W. M. Vaughey, chairman of the executive committee, Independent Petroleum Association of America, in a statement before the antitrust and monopolistic subcommittee, Senate judiciary committee.

O.C.A.W. Defends Price Hike

"The sudden furor in Washington against the oil industry is curious. The industry raised prices—a procedure not wholly unheard of in any American industry—for the first time in quite a spell and all of a sudden everybody is hollering that this is a dastardly plot.

"This union has pointed out the fact that wage increases have not justified the increase. And we must grant credit to the oil industry that most of its spokesmen have not tried to blame the increase particularly on labor.

"One thing is clear: The oil industry has been less inclined during the past decade to jack up prices once every year and twice on leap year than have most businesses. The oil companies' record for holding the line on prices has been outstanding in comparison with virtually all other industries."

Editorial in the Union News, newspaper of the Oil, Chemical, and Atomic Workers International Union.

A Reason for Investigation

"Much of the furor that has led to congressional inquiries into the oil situation has been created by the complexity of the industry itself.

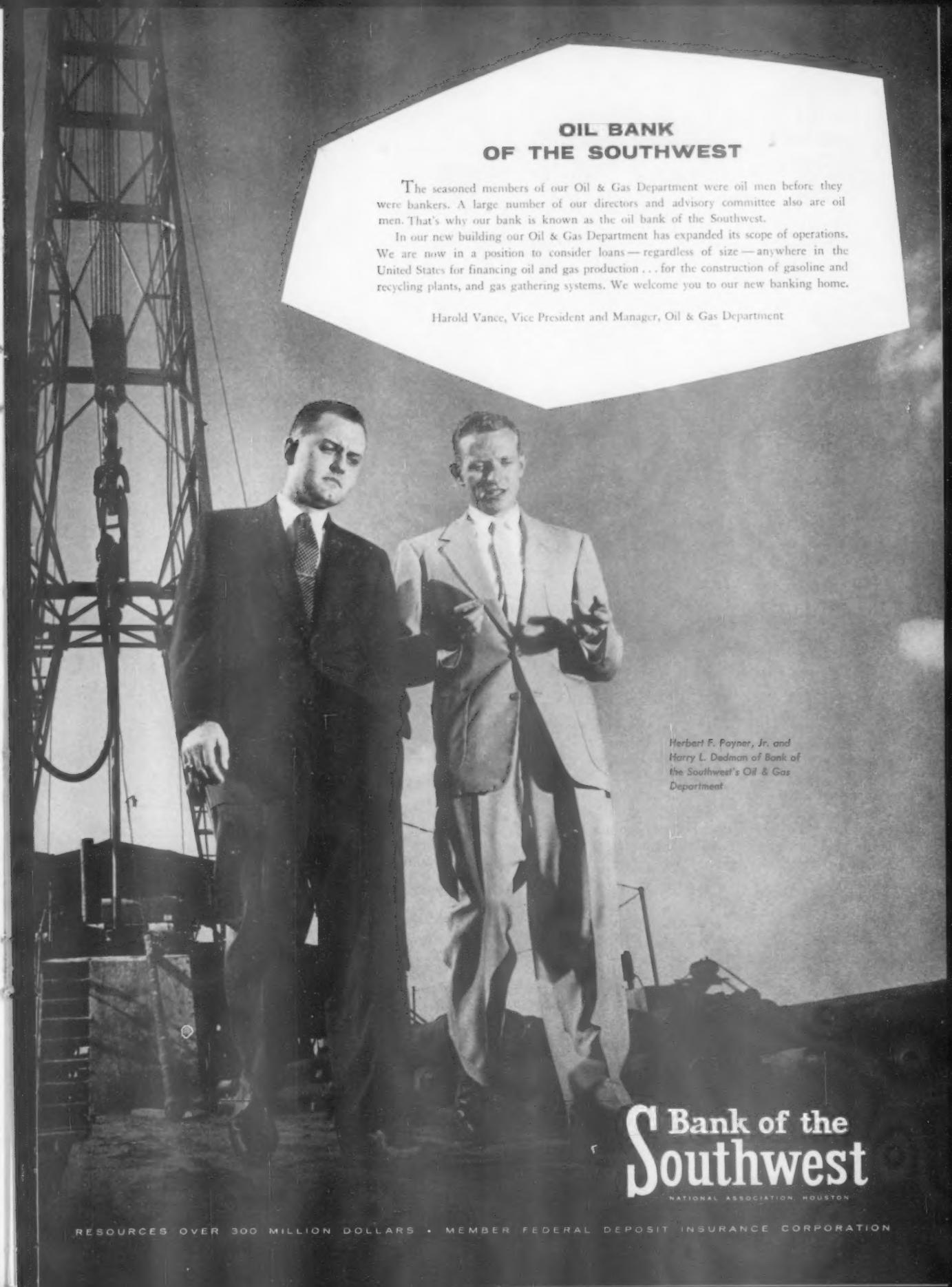
"Admittedly, the competition in the industry is free wheeling and rugged. In the search for oil the industry has security regulations matching any in the Pentagon's code book. There has been a tendency in this direction that has laid the entire industry open to public doubts and which, as is now happening, often drags it before the bar of Congress to answer for its acts.

"It is important that such investigations . . . do not fail to take into consideration the many ramifications of the oil business, that it possibly has more related angles in so many directions than any other American industry."

Editorial in the Tulsa Daily World.

Canadian Oil's Potential Enemy

"Perhaps the main potential enemy (of the Canadian oil industry) is the danger of excessive regulations, the introduction of controls or compulsory systems without sufficient investigation as to the need for them, the practicability of objectives, or the availability



OIL BANK OF THE SOUTHWEST

The seasoned members of our Oil & Gas Department were oil men before they were bankers. A large number of our directors and advisory committee also are oil men. That's why our bank is known as the oil bank of the Southwest.

In our new building our Oil & Gas Department has expanded its scope of operations. We are now in a position to consider loans — regardless of size — anywhere in the United States for financing oil and gas production . . . for the construction of gasoline and recycling plants, and gas gathering systems. We welcome you to our new banking home.

Harold Vance, Vice President and Manager, Oil & Gas Department

Herbert F. Poyner, Jr. and Harry L. Dedman of Bank of the Southwest's Oil & Gas Department

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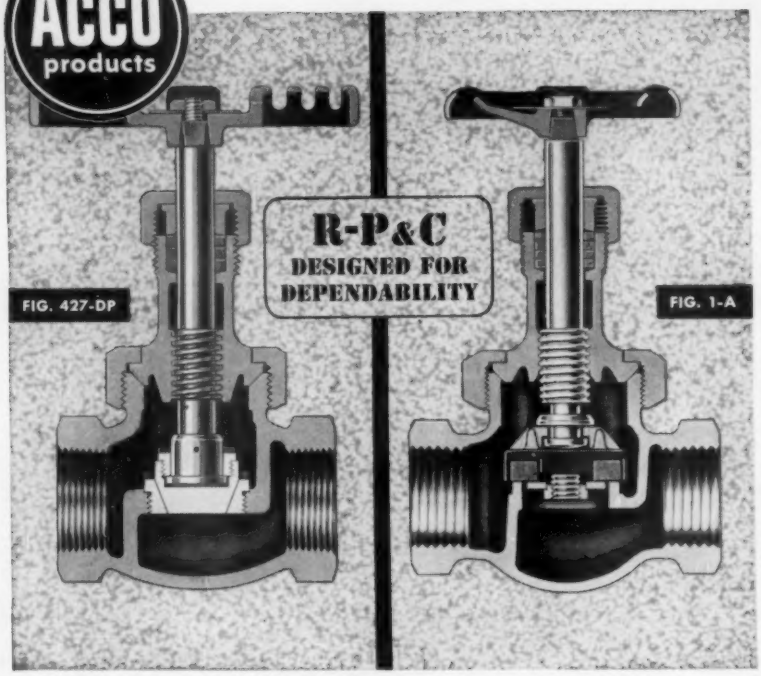

Bronze Globe Valves

14 DIFFERENT MODELS— ONE FOR YOUR SPECIFIC REQUIREMENTS

• R-P&C's complete valve line includes 14 different models of bronze globe valves, each in a complete range of sizes. Ranging in pressure classes from 125 to 300 lbs., they include flanged or screwed ends, union or screwed bonnets and a variety of seat and disc constructions. One of these 14 valves will solve your particular problem.

For example, **Fig. 427-DP** above was developed specifically for services where control or regulation of flow is required. The full-plug construction permits closer regulation—and the stainless steel seat and disc (500 Brinell) resist wire-drawing, give longer life. Rated for 300 lbs. Steam—1000 lbs. OWG.

FREE WALL CHART
"How to Protect Your Valves"
22" x 17" wall chart gives installation and operation pointers. Tells how to protect valves, prolong life. Write for your copy.

The **Fig. 1-A** valve, rated for 150 lbs., was developed for applications requiring tight shut-off and frequent operation. The special asbestos-composition disc seats tightly even if particles of foreign matter are trapped between seat and disc. The disc is easily renewed.

No matter what your requirements in bronze globe valves, R-P&C has the answer. And this holds true for angles, gates and check valves in iron and cast steel, also forged steel gates. See your R-P&C dealer today, or write for catalog.

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AMERICAN CHAIN & CABLE

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R-P&C valves

of competent personnel to do the job.

"Not only do we need to be vigilant against the introduction of unnecessary regulations in the future, but the industry must guard against regulations and regulatory bodies already in force which might now be dispensed with.

"It seems to me that in the interests of all concerned, all unnecessary restrictions—which means all unnecessary barriers and hazards to the potential investor—should be removed."

J. R. White, president, Imperial Oil, Ltd., at a celebration at Edmonton of the tenth anniversary of the discovery of Leduc field.

CALENDAR OF EVENTS

MARCH

- **6** American Institute of Mining, Metallurgical and Petroleum Engineers, North Texas section, and North Texas Geological Society, 1957 engineering and geological conference on the Strawn-Pennsylvanian of North Texas, Midwestern University auditorium, Wichita Falls, Tex.
- **6-8** American Petroleum Institute, southwestern district production division meeting, Statler-Hilton Hotel, Dallas
- **8** Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.
- **11-13** Chemical Institute of Canada, seventh chemical engineering divisional conference, LaSalle Hotel, Kingston, Ont.
- **11-15** 1957 Nuclear Congress, sponsored by National Industrial Conference Board and Engineers Joint Council, Convention Hall, Philadelphia.
- **11-15** American Institute of Chemical Engineers, regional meeting, Philadelphia
- **11-15** National Association of Corrosion Engineers, Kiel Auditorium, St. Louis
- **11-21** Quality Control by Statistical Methods, tenth annual short course, sponsored by University of Illinois, College of Engineering and Division of Engineering Extension, Champaign, Ill.
- **12-13** Subsurface Geology Symposium, fifth annual conference, sponsored by the University of Oklahoma, Norman Okla.
- **13-15** Society of Exploration Geophysicists, tenth annual mid-western meeting, Hotel Texas, Fort Worth.
- **14** American Society for Testing Materials, New York district meeting, New York City.
- **18-21** American Society of Mechanical Engineers, national conference, gas-turbine power division, Sheraton-Cadillac Hotel, Detroit.
- **20-22** American Petroleum Institute, southern district production division meeting, Washington-Youree and Captain Shreve Hotels, Shreveport, La
- **25-27** Western Petroleum Refiners Association, annual meeting, Hilton Plaza Hotel, San Antonio, Tex.
- **25-29** American Society for Metals, Western Metal Exposition and Congress, Am-

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TRAILER MOUNTED MASTS

EXTENDED IN HORIZONTAL POSITION FOR MAXIMUM SAFETY

LEE C. MOORE trailer mounted masts are extended full length while in horizontal position and then mechanically raised to drilling position. This mast design has met the approval of the drilling industry everywhere because its operation is safe . . . fast . . . simple . . . dependable.

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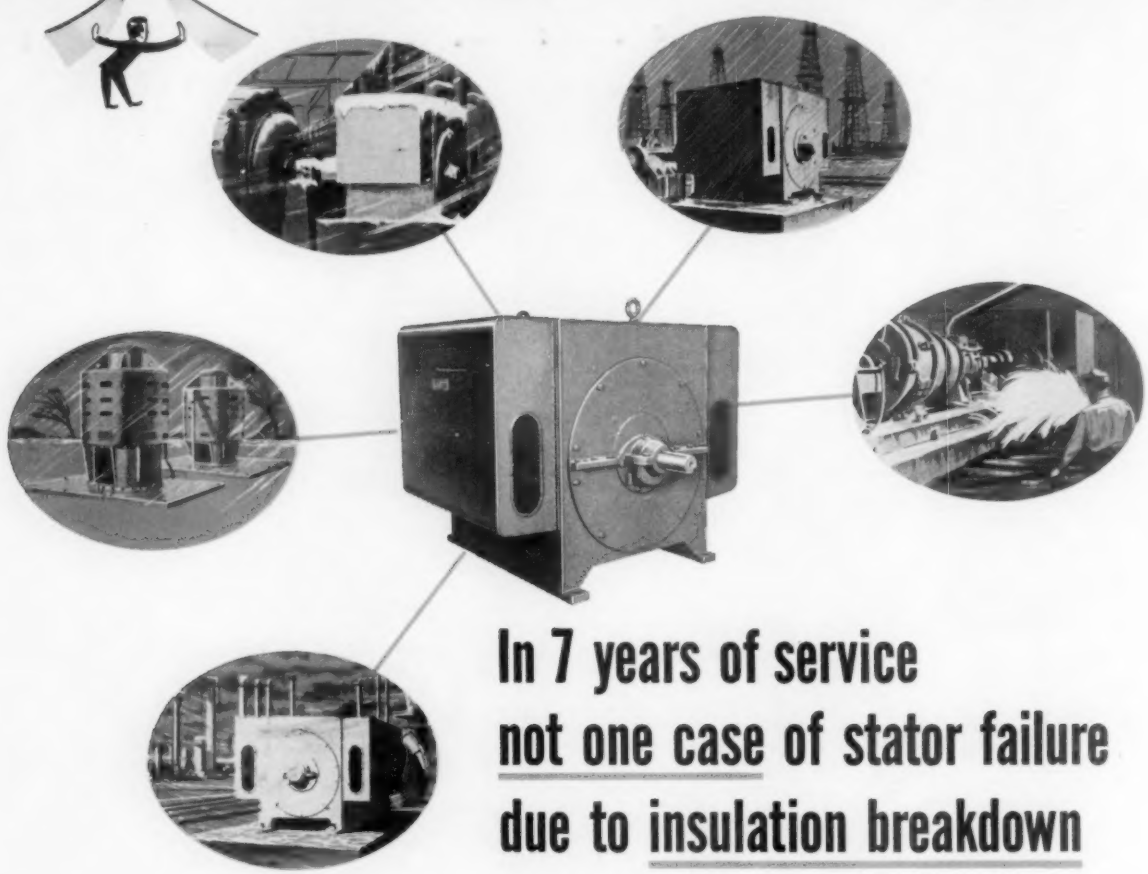

In 7 years of service not one case of stator failure due to insulation breakdown

Merchandising alone doesn't "make" a motor. Fancy names, laboratory tests and "miracle formulas" don't mean a thing until actual, on-the-job service records back them up.
Elliott insulation in large, squirrel-cage induction motors has proved itself. Since 1948, when Elliott weather-protected motors first went on the job, *not one* motor has failed because of insulation troubles. This is the record chalked up by more than 1,400,000 hp of motors in service – 500,000 hp of them in rigorous outdoor service operating in extremes of dampness, rain, snow, sleet, hurricanes, tornadoes, oil fumes, salt spray, and many other unusual conditions. What better proof of motor insulation dependability can you ask for?

This "outdoor" insulation system has been so successful that it has been extended to the entire Elliott large induction motor line wherever possible. For details see your Elliott field engineer or write Elliott Company, Ridgway Division, Ridgway, Pa.

MODERN ELLIOTT COIL INSULATION... and winding treatment combines the latest in materials with the know-how and thoroughness of application to make them successful. Some highlights:

- Ground insulation combining the ageless and high temperature resisting characteristics of mica with the tough, flexible support of Mylar* backing.
- A permanently elastic insulating varnish.
- Vacuum-pressure impregnation for sure, complete penetration. (Completely wound stator is finally sealed by immersion in a specially suited insulating varnish.) Bulletin PB 1400-4 tells the whole story. Write for a copy.

*Dupont Trademark

RG-9

ELLIOTT Company

Elliott large motor insulation is "field-proven"

bassador Hotel and Pan-Pacific Auditorium, Los Angeles.

27-29 American Power Conference, Sherman Hotel, Chicago.

30 North Texas Oil and Gas Association, twenty-seventh annual meeting, Kemp Hotel, Wichita Falls, Tex.

APRIL

1-4 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, national convention, Kiel Auditorium, St. Louis.

2-4 Corrosion Control, fourth annual conference, sponsored by National Association of Corrosion Engineers and the University of Oklahoma College of Engineering, University of Oklahoma, Norman, Okla.

7-10 Petroleum Equipment Suppliers Association, annual convention, Palm Springs, Calif.

7-12 American Chemical Society, national meeting, Miami, Fla.

8-10 American Society of Mechanical Engineers, spring meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala.

9 American Institute of Chemical Engineers, Philadelphia - Wilmington section, University of Pennsylvania, conference on catalysis in practice, University Museum, Philadelphia.

9-11 American Welding Society, fifth annual welding show, Convention Hall, Philadelphia.

10-12 American Petroleum Institute, Mid-Continent district production division meeting, Mayo Hotel, Tulsa.

11-12 West Texas Oil Lifting Short Course, Texas Technological College, Lubbock, Tex.

11-13 Institute of Radio Engineers, ninth annual southwestern I.R.E. conference and electronics show, sponsored by Houston section, Shamrock Hilton, Houston.

11-13 Institute of Radio Engineers, second national simulation conference, sponsored by Professional Group on Electronic Computers, Shamrock Hilton Hotel, Houston.

11-13 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Northwest Regional Conference, Portland, Ore.

16-18 Petroleum Industry Electrical Association annual meeting, Shamrock Hilton Hotel, Houston.

16-18 Petroleum Electric Suppliers Association, Shamrock Hilton Hotel, Houston.

16-18 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

16-18 National Petroleum Association, fifty-fourth semiannual meeting, Cleveland.

18-19 Texas Petroleum Research Committee and Permian Basin Section of American Institute of Mining, Metallurgical, and Petroleum Engineers, tenth annual oil-recovery conference, Midland, Tex.

22-25 Canadian Institute of Mining and Metallurgy, annual general meeting, Chateau Laurier, Ottawa.

24-26 Natural Gasoline Association of America, thirty-sixth annual convention, Rice Hotel, Houston.

24-26 American Petroleum Institute, Rocky Mountain district production division meeting, Gladstone, Townsend, and Henning Hotels, Casper, Wyo.

25-27 Appalachian Geological Society, Kentucky Geological Society, joint field conference, southeastern Kentucky.

25-27 American Association of Petroleum Landmen, third annual convention, Hilton Hotel, San Antonio, Tex.

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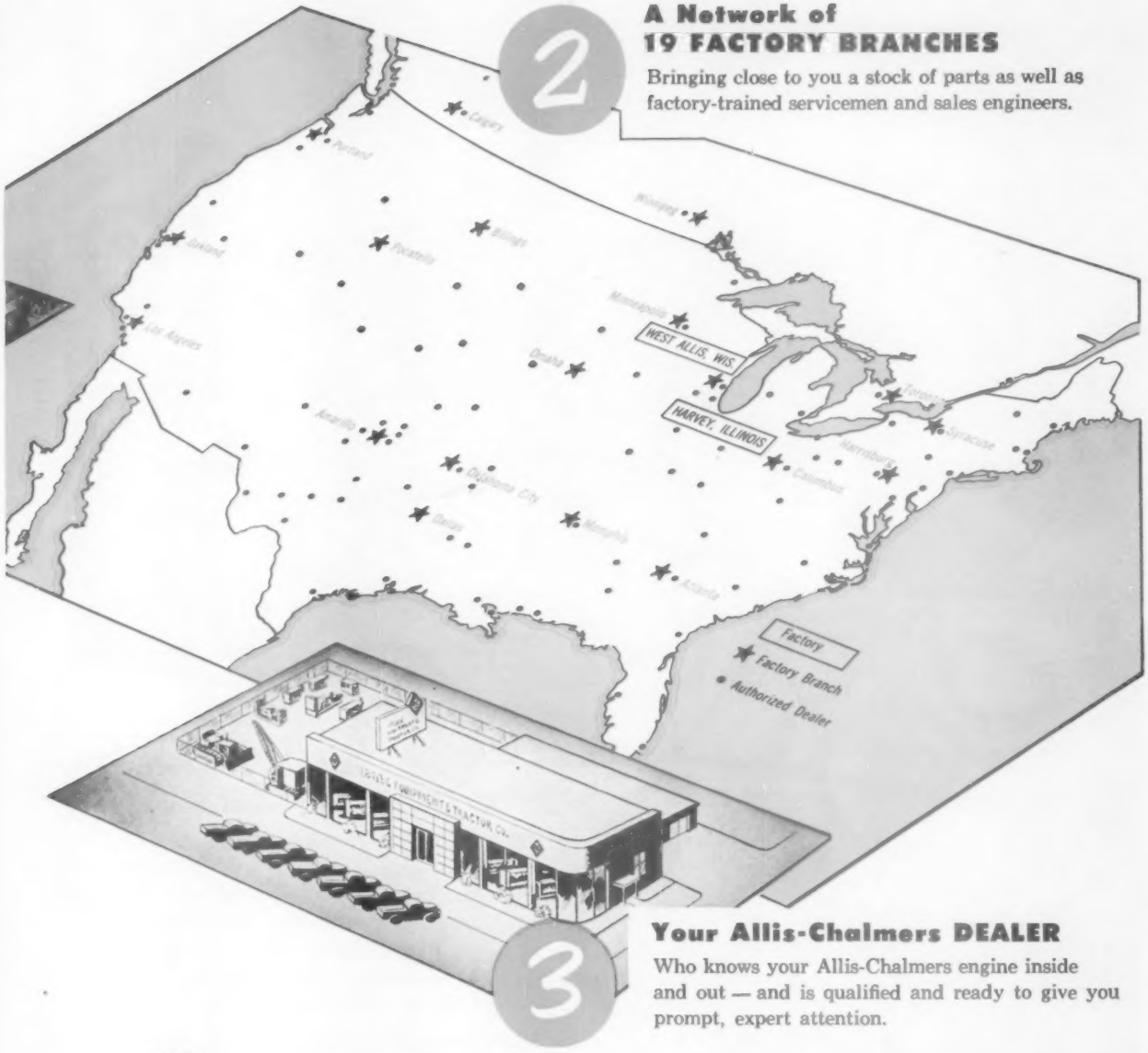
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Who knows your Allis-Chalmers engine inside and out — and is qualified and ready to give you prompt, expert attention.

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Ask your Allis-Chalmers engine dealer to show you how this *3-deep* service can help on your specific engine needs. Write for literature and details.

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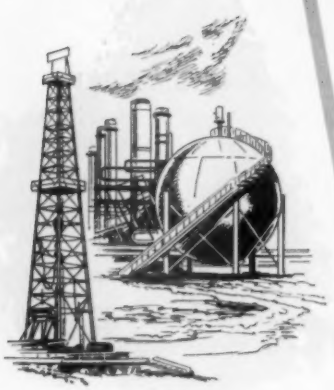

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28-30 Independent Petroleum Association of America, midyear meeting, Buena Vista Hotel, Biloxi, Miss.

29-30 Automatic Control in the Petroleum and Chemical Industries, conference sponsored by the University of Oklahoma, extension study center, University of Oklahoma, Norman, Okla.

29-May 1 Southern Gas Association, annual convention, New Orleans.

MAY

1-3 American Petroleum Institute, Division of Production, eastern district meeting, William Penn Hotel, Pittsburgh.

6-8 American Petroleum Institute, annual pipeline conference, Cleveland Hotel, Cleveland.

6-8 American Geophysical Union, thirty-eighth annual meeting, National Academy of Sciences, Washington, D. C.

7 American Gas Association, committee on underground storage, operating section, Mark Hopkins Hotel, San Francisco.

8-10 American Gas Association, Pacific Coast Gas Association, gas supply, transmission, and storage conference, Mark Hopkins Hotel, San Francisco.

9-10 Symposium on use of surface active agents in water flooding, Pennsylvania State University, department of petroleum and natural gas, State College, Pa.

12-15 Liquefied Petroleum Gas Association, annual meeting, Conrad Hilton Hotel, Chicago.

13-15 Industrial Waste Conference, sponsored by Purdue University, Purdue Memorial Union Building, Lafayette, Ind.

13-16 American Petroleum Institute, division of refining, midyear meeting, Sheraton Hotel, Philadelphia.

14-16 Industrial Nuclear Technology Conference, sponsored by Armour Research Foundation of Illinois Institute of Technology and Nucleonics Magazine, Museum of Science and Industry, Chicago.

16-17 American Petroleum Institute, division of production, Pacific Coast district meeting, Hotel Biltmore, Los Angeles.

19-22 Texas Independent Producers and Royalty Owners Association, Galvez and Buccaneer Hotel, Galveston, Tex.

20-22 American Petroleum Institute, division of transportation, central committee on transportation by water and tanker corrosion symposium, San Francisco.

20-22 American Gas Association, chemical, engineering, and manufactured gas production conference, Balmoral Hotel, Bal Harbour, Fla.

20-23 American Society of Mechanical Engineers, twenty-ninth annual conference and exhibit of the oil and gas power division, Kentucky Hotel, Louisville, Ky.

21-23 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

23-24 Kentucky Oil and Gas Association, annual membership meeting, Hotel Phoenix, Lexington, Ky.

23-24 American Institute of Mining, Metallurgical, and Petroleum Engineers, third annual joint meeting, Rocky Mountain petroleum sections, Northern Hotel, Billings, Mont.

23-24 Western Petroleum Refiners Association, southwest regional technical-industrial relations meeting, Hotel Paso del Norte, El Paso, Tex.

29-31 Annual short course in gas technology, Texas College of Arts and Industries, Kingsville, Tex.

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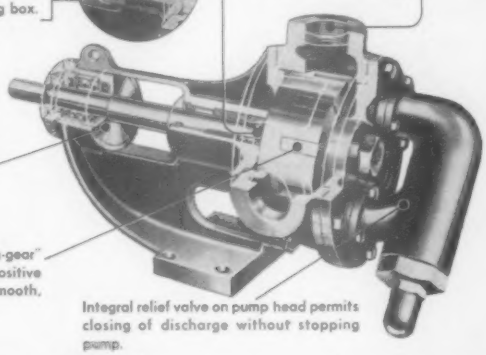
with VIKING Heavy Duty Pumps

The Viking mechanical seal WORKS WITH, rather than against pressure, assuring non-leak operation.

Pump also available with extra long, leak-resistant stuffing box.

Revolvable casing makes possible handy, most economical piping arrangement... ports can be turned to 8 different positions.



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Slow speed "gear-within-a-gear" pumping principle means positive delivery, fast priming and smooth, even discharge.

Integral relief valve on pump head permits closing of discharge without stopping pump.

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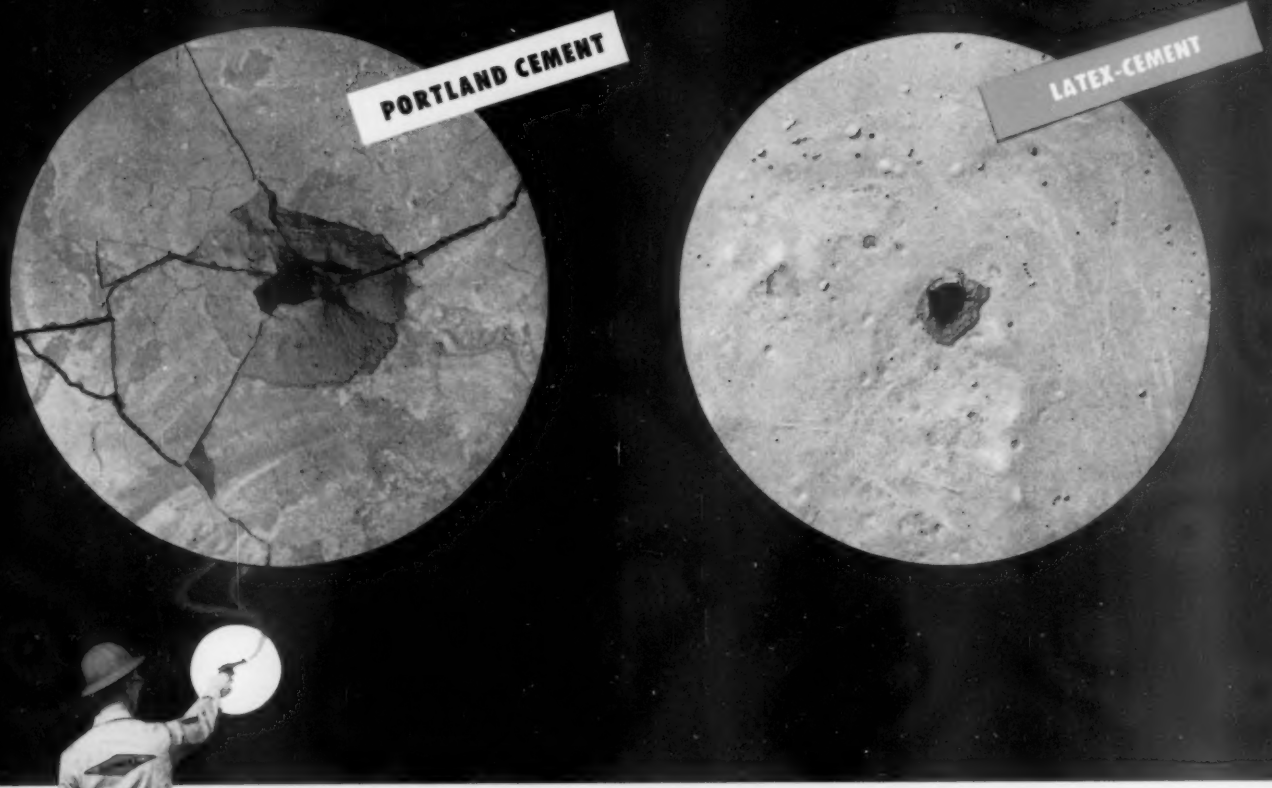

Here's one reason why CEALMENT has given better cement jobs

Most operators have had wells where perforating brought in unwanted gas and water in addition to desired oil production. Cement shattered by perforating shots could have been the cause. Costly squeeze jobs and re-perforating, with attendant rig time, are required to remedy the condition.

Cealment*, an exclusive Dowell service that utilizes latex-cement, helps you avoid many of the causes of faulty cement jobs. Latex-cement is more resilient than common Portland. That's why the man in the photograph could fire a 38-caliber revolver bullet through the latex-cement disk (right) without shattering it. The disk at left is common Portland cement after receiving the same treatment.

Laboratory tests and field experience indicate that the same thing may happen in your well. Cealment is especially useful for cementing a thin oil zone with gas or water nearby.

Resiliency is only one of many advantages of latex-cement. It bonds better, sets more dependably, and has shown excellent resistance to contamination by well fluids. More and more operators are finding that they are money ahead when they use Cealment.

For service, or for more information, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

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The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

How to Find Oil

FINDING oil is easy. Oil men have a kind of a gadget they call a seismograph which they carry around wherever they want to look for oil. By reading the dial they can tell whether or not there is oil under their land, and how deep it is. Then all they have to do is drill a hole, get a gusher, and become a Texas millionaire.

At least that seems to be the popular impression.

Last week we had an opportunity to see for ourself just how simple it is to find oil with this seismograph thing. We spent an afternoon being conducted through the headquarters of a big seismograph company while learned savants explained how the instruments work. Since we had never found any oil ourself, we took careful notes, and are passing them on for the enlightenment of anyone who may want to get on the oil men's gravy train.

First, we discovered, you can't tell how much oil is down below simply by reading a dial. The doodad out in the field just makes a lot of squiggly marks on paper, and these have to be sent in to the main office to be "interpreted." That's the proper word for it, too, because it's in a foreign language. And when the scientific interpreters get through with it, it's still in a foreign language so far as we are concerned.

For example, we were told that the squiggles have to be considered from the standpoint of continuous profiling technique and the interrelationship between geology and geophysics, have to be checked against velocity information, and have to be compared with stored seismic data from a variable-area recording system.

The headquarters office has rooms and rooms full of mysterious but important-looking electronic apparatus to provide all this dope. One of these is continuous-velocity logging, which supplies subsurface geological correlation and porosity data. It gets these from an ultrasonic generator and a times-versus-depths recording plotter. The interval velocity is checked with an oscilloscope. Before the development of this handy little gadget, the potential of the velocity principle was veiled, but it now points out clearly the conditions necessary for the origin of reflections.

The next step is to feed the dope into a continuous-velocity log-scale converter which performs a variety of vertical and horizontal scale conversions while tracking the original log. This produces a variable-area film from which synthetic seismic reflections may be generated, and while tracking the interval-velocity curve it will also give the logarithm of the interval-velocity plus indexes of reflective capability.

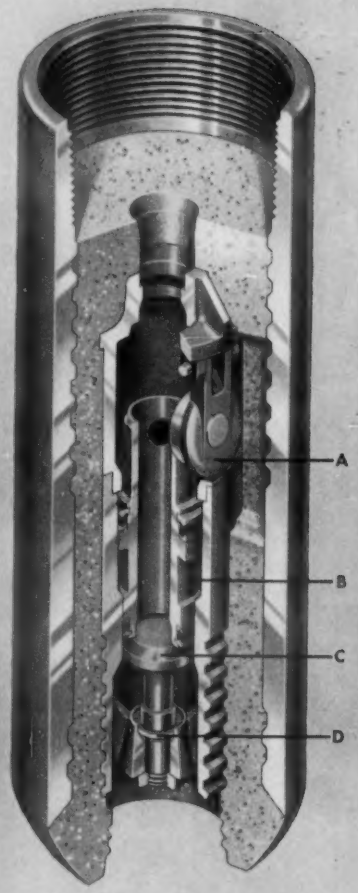
Another step in simplifying the oil-finding process is the optical analog gravity computer which produces a synthetic gravity profile which displays the equivalent gravity response. It does this by means of a graticule in which each area contributes equal increments to the gravitational field so that when superimposed by optical grid filters the instrument reading may be conveniently expressed in milligals.

There's still more to the process. For instance, time-corrected traces are photographed in up to 234 channels, and such wide recording in a new type of pictorial presentation greatly facilitates interpretation. There's also something called a zero header which apparently converts Lorac to Actrac, but at this point we became a little confused.

Newest and best is a variable-density recorder which has a cross-section camera and a seismic replay console to process magnetic field recordings so as to display a simulated variable-density cross-section. According to the man, this device "promises to be a definite step toward making the understanding of the art less confusing to the uninitiated."

We hope that machine keeps its promise and makes some more steps. At present we're awful uninitiated.

—Henry D. Ralph.



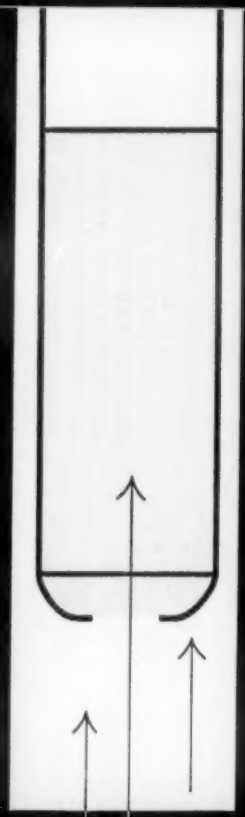
A Flapper Type Back-Pressure Valve activated at option of operator.

B Sleeve Valve } Control rate of flow and volume of fill-up fluid.

C Sleeve Valve Seat }

D When operator shears this Shear Ring (1,000 psi on casing), Flapper Valve is released to form a Back-Pressure Valve for floating or cementing.

Baker DIFFERENTIAL FILL-UP Shoe
Product No. 1081

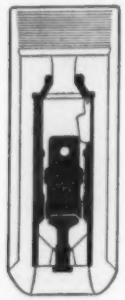


It fills casing from the bottom up

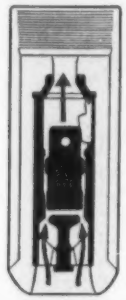
With Baker DIFFERENTIAL FILL-UP Shoes and Collars, casing is filled automatically from the bottom up, *while it is being run*... and because DIFFERENTIAL Equipment contains a Variable Valve *that opens and closes* to synchronize the rate of "fill" with the rate of lowering the casing, maximum reduction of destructive high-pressure surges is obtained.

This "controlled automatic fill" saves up to one-third of running-in time because... (a) time-wasting surface filling of casing is eliminated; and (b) casing can be run in at a faster speed, reducing the possibility of sticking, without causing destructive high-pressure surges. Pressure surges over 5000 psi can be created below casing equipped with floating equipment each time a joint is lowered. Damage caused by these high-pressure surges and the cost of this damage in bad cement jobs, lost circulation, and decreased production is becoming a matter of concern to many operators.

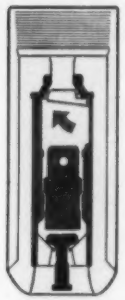
HOW DIFFERENTIAL EQUIPMENT WORKS



RUNNING-IN
Sleeve Valve in closed position



RUNNING-IN
Sleeve Valve in opened position



CEMENTING OR FLOATING
Flapper Valve released

Hydrostatic pressure of the "fill" acts on the upper pressure area of the sleeve valve. Hydrostatic pressure of the fluid in the annulus acts on the lower pressure area of the valve which is 90% of the upper pressure area. It is this differential in area that results in a "fill" of approximately 90% (shoe or collar), or 81% (shoe and collar) with respect to the fluid level of the annulus and gives the equipment its name. The valve opens and closes in accordance with the pressure differential across it to: (1) fill the casing automatically, (2) reduce pressure surges and (3) prevent overfill of the casing.

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What can be learned from the Suez mess

WHAT have we learned as a result of the Suez Canal closing, the emergency oil lift for Europe, and the hullabaloo over alleged failures of the oil industry?

Anything that should influence the future course of the oil industry, the Government, and our long-range economic and defense planners? Senators and others may draw a variety of conclusions. But these things seem evident:

- The unpredictable international politics of the Middle East cast doubt over the future availability of oil from that region. Both Europe and the United States should reevaluate the degree of dependence to be placed on that source.

- The Suez Canal may never regain its former importance as a trade artery. This is particularly true as to oil, due to physical limitations as well as political uncertainties. New pipelines and tanker routes from the Persian Gulf may develop.

- Our national oil policy must be based on the realities of the Middle East situation. Until the uncertainties are removed there, provisions should be made for meeting emergencies with oil from other sources.

- The importance of a strong domestic oil industry has been reemphasized. A standby producing capacity, built and carried by the industry at its own expense, saved the day this time.

- Better balance is needed in the industry for emergency needs and also for healthy growth. If there had been in existence standby transportation facilities comparable to crude-producing capacity, much more oil would have been available quicker.

- The oil industry did a good job of solving the physical problems of the oil lift, supplying more than 80 per cent of Europe's needs with no domestic shortages whatever. Government operation could not have done as well.

- The industry invited suspicion because of its intramural name calling and buck passing, its reluctance to disclose what it was doing and why, and its failure to anticipate public reaction.

- Domestic politics embroils the reshaping of a national oil policy. There are the traditional pressures of protectionists versus free traders, of producers versus importers, of independents versus majors. There is also the politician's distrust of anything concerned with oil.

- Now, while the Suez crisis persists and the problems of the industry are in public view, is the time to plan for the future. This calls for some far-sighted statesmanship that can see beyond the political rivalries and pressures of the moment.

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The Industry This Week

• **IMPORTS:** Reopening of Suez will force some tough decisions on imports. The headache will be compounded by these trends revealed in latest statistics: Canada and Venezuela are gaining a larger share of the U. S. market. P. 58.

Independent producers have launched an attack on importers in testimony before the O'Mahoney committee. O'Mahoney, as a result, warns the majors they may be riding for some form of federal control. P. 60.

But Socony's Brewster Jennings last week told A.I.M.E. delegates: Middle East oil reserves so dwarf Western deposits, the time may come when the Americas will depend on Persian Gulf supplies. P. 64.

Just what is the M.E.E.C.? Its misunderstood role in the Suez crisis is one of the mysteries of the emergency. P. 68.

• **DRILLING:** Why the big slump in drilling activity? Oil men are confused by this downward trend in an otherwise healthy industry. Mostly they blame tight money, political confusion, and offshore and foreign operations. P. 66.

• **GENERAL INTEREST:** Broad investigation of oil industry is getting under way before federal grand jury at Alexandria, Va. It may last for 4 to 6 months. Tipoff on its scope: FBI agents are known to be questioning oil officials privately and witnesses are being called from nearly every section of country. P. 77.

Gulf will invade vast new marketing area with its third-grade, super-premium gasoline. It could herald a tightening of the octane race. P. 64.

• **PRODUCTION:** First lease automatic custody transfer setup in Texas has proved a big success. Shell reports units record crude accurately and actually save oil. This leads Railroad Commission to extend the trial period and permit other producers to start using LACT. P. 61.

Colorado has moved to almost double ultimate recovery from state's two largest fields. Conservation Commission has ordered Rangely operators to unitize and approved plans for a water flood in Adena. P. 74.

Declining free-world production has halted. Output in December recouped November's losses and came within 5.6 per cent of normal. P. 81.

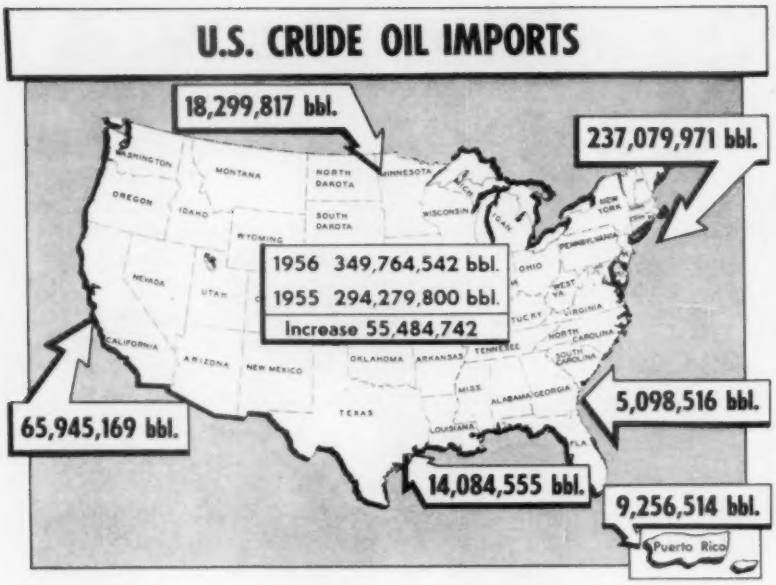
• **PIPELINING:** Natural gas may find coal a rising competitor for the expanding Florida energy market. FPC last week gave tantamount approval to the Texas-Florida gas line. At the same time, however, big coal producers and eastern railroad officials met with Florida utilities trying to get a share of the fuel market. P. 70.

Showdown is nearing in Texas between producers and pipelines over unconnected wells. Railroad commission will start a sweeping hearing into the controversy April 1. P. 62.

A proposal to build a crude line from Texas to Philadelphia is picking up backing. During a recent Washington visit, Gen. E. O. Thompson laid the groundwork for Government backing by selling the defense angle of such a line: It's safer than tankers, which might be submarined. P. 75.

• **EXPLORATION:** Rocky Mountain geologists got this advice last week: "Trap thinking" must replace structural thinking if the great potential of the region is to be realized. P. 67.

Deep drilling has turned up an extensive east-west producing trend in Eastern Venezuela. Two good wells have been completed and two are testing along a 10-mile line. P. 82.



Imports Crisis Builds Up

● Reopening of Suez will force tough decisions; latest figures show 1956 was record year for imports with oil from Canada, Venezuela gaining more of domestic market

THE toughest decision on oil imports will come to a head soon.

When Suez is restored, the subject immediately will come to the front as a burning political and economic issue.

Just what is the situation? A look at latest figures reveals trends apparent in 1956 which point out the areas of trouble.

U. S. imports of crude increased more than ever before last year. This jump came despite the greatest disruption in ocean-borne oil traffic in history resulting from trouble in the Middle East.

Figures for 1956 compiled by The Oil and Gas Journal from customs records show imports approached 350,000,000 bbl., an all-time high. This is an increase of more than 56,000,000 bbl. from the 1955 total.

The trends . . . The Suez closing actually only had a slight depressing effect on 1956 imports.

They slowed up in December. But the effect of Suez will be felt more during the first half of 1957. After that oil should be flowing through the canal and Iraq pipeline. Then these trends noted in 1956 will become important:

. . . Canada is emerging as a bigger factor in imports. Its shipments to the U. S. Pacific Coast and the Great Lakes region are taking tremendous jumps.

. . . Venezuelan imports are still pushing upward.

These two factors have increasing importance.

In the past U. S. officials have given these two countries favored treatment. They consider Canadian oil practically in the same category as domestic production. Also they don't favor heavy cuts in Venezuelan imports for defense reasons. As a result, pressure for imports cuts has been applied chiefly to Middle East crude.

What about Canada? . . . Imports into the United States from Canada jumped to 43,200,000 bbl. last year.

They totaled 16,237,327 bbl. in 1955 which meant a 170 per cent jump last year. Only 2 years ago, Canada supplied just over 1 per cent of U. S. imports. Last year Canadian oil represented more than 12 per cent of imports. In fact, it moved into the third-ranking source of imported crude behind Venezuela and the Middle East.

Most of the Canadian oil went to the Seattle area through the Trans-Mountain Oil Pipe Line Co. system and to San Francisco and Los Angeles by tanker. A substantial quantity —about 42 per cent—moved east to the Great Lakes area by the Interprovincial pipeline and rail.

This volume, especially to the Pacific Coast, is expected to increase even more. Trans-Mountain plans to loop 100 miles of its line this year to boost capacity to 240,000 bbl. daily. It expects throughputs of 400,000 to 500,000 bbl. daily within 5 years *(The Oil and Gas Journal, February 25, page 95).*

Also the booming Pacific Northwest region of the United States alone expects present refining capacity of 165,000 bbl. daily nearly to double within the next 2 years *(The Oil and Gas Journal, December 24, page 32).*

Where it goes . . . The rising flow of Canadian oil is underscored by figures at the importing points.

On the Pacific Coast, imports at Seattle jumped from 11.6 million barrels in 1955 to 20.3 million barrels last year. San Francisco went from 16.2 million barrels to 25.6 million; Los Angeles from 5.7 million to 19.9 million.

Of course, all of this oil didn't come from Canada. But the bulk was Canadian imports. Other big sources of imports to the West Coast included:

. . . Venezuela. Cargoes from there jumped nearly 10,000,000 bbl.

. . . Kuwait. More than 5,000,000 bbl. came from this Middle East area.

. . . Neutral Zone. Shipments totaled 2,500,000 bbl.; more than double the previous year. These totals in the table are included in figures for Kuwait and Saudi Arabia.

All these sources raised West Coast imports to 66,000,000 bbl. in 1956. That was nearly a 100 per cent gain over 33,667,371 bbl. imported in 1955. The West Coast represented nearly 19 per cent of the country's imports against 7.5 per cent only 2 years ago.

The Mid-West market . . . Canadian oil also began carving out a larger market for itself in the Great Lakes region of the U. S. Mid-West.

At the Canadian border, imports through Great Falls, Mont., jumped from 85 bbl. in 1955 to 132,328 bbl. last year. Oil through the Pembina, N. D., railhead went from 254,145 bbl. to 982,568 bbl. The flow through pipeline at Duluth rose from 4.8 million barrels to 15.3 million and at Detroit from 144,541 bbl. to 1,781,370 bbl.

The Canadian oil receipts boosted rank of the Great Lakes region as an importer. Oil imports were up three times what they were a year earlier and more than 10 times the 1954 total.

Actually the Great Lakes imports may become more important than West Coast imports. Here's the reason: Imports on the West Coast replace very

little domestic crude. They are moving in to help fill a growing demand which California's own production isn't able to meet.

But Canadian oil moving into the Mid-West is taking expanding markets which normally would be filled by Mid-Continent or Rocky Mountain crudes. Some economists say it will tend to replace domestic crudes. At least, it will be competitive with the U. S. crudes.

The East Coast trend . . . While imports were booming on the Pacific and around the Great Lakes, the situation on the East Coast was steady.

East Coast refiners did import more oil—but only about 2 per cent more. The imports dropped rapidly in the last quarter. Up to that point they had averaged about 9,200,000 bbl. per month, nearly 300,000 bbl. daily. This average dropped to slightly more than 200,000 bbl. daily for the last quarter. In December, however, they were down to an average of less than 160,000 bbl. daily.

These cuts were offset by higher domestic imports from Venezuela. That country continued to be the major supplier. Imports from there reached 174,000,000 bbl., up 25,000,000 bbl. from a year earlier. This increase was second only to Canada's boost of 27,000,000 bbl.

The Middle East supplied 102,490,126 bbl. Biggest individual countries represented in that total were Kuwait with 52.2 million barrels and Saudia Arabia with 28.1 million barrels.

Refining picture . . . Only two new trends were noted in refining centers handling imported crudes.

Norfolk appeared for the first time as an importer. A total of 1,298,495 bbl. went through that district, apparently for Tidewater's new Delaware City refinery.

Baltimore's business dropped sharply from 7.4 million in 1955 to 5.9 million.

Rankings of the other refining centers remained the same. Philadelphia dominated the coast, importing 161.7 million barrels. New York brought in 60.7 million and Boston 6.4 million.

The outlook . . . It's anyone's guess when imports again will reach levels that pinch domestic producers.

Economists predict they will pick up during the second quarter of this year and hit their precrisis stride in the third quarter *(The Oil and Gas Journal, January 28, page 172)*. On this basis crude imports are expected to average 869,000 bbl. daily for the year, only slightly under 1956.

Where U.S. Crude Imports Come From . . .

	1952	1953	1954	1955	1956
Canada	1,127,182	2,650,209	2,606,437	16,237,327	43,228,064
Latin America:					
Mexico	6,273,856	4,342,622	5,036,738	6,446,874	5,989,765
Colombia	16,233,858	15,200,052	12,655,096	8,143,560	9,176,154
Venezuela	119,325,047	116,058,528	129,585,987	148,990,839	174,181,059
Ecuador	316	89,800	300,230	408,853	430,992
Peru			608,620	855,579	613,630
Trinidad			459,139		441,947
Total Latin America	141,833,077	135,691,002	148,645,810	164,845,705	190,833,547
Total W. Hemisphere	142,960,259	138,341,211	151,252,247	181,083,032	234,061,611
Middle East:					
Saudi Arabia	29,284,718	36,949,052	30,310,034	28,984,537	28,161,526
Iran			208,043	3,075,037	6,155,709
Kuwait	26,651,629	38,569,253	41,676,847	56,275,637	52,298,049
Qatar	403,870	3,149,956	2,751,113	5,447,109	5,994,737
Iraq	705,600	1,575,665	2,188,278	7,011,599	9,880,105
Lebanon*	176,192			624,499	
Total Middle East	57,222,009	80,243,926	77,134,315	101,418,418	102,490,126
Far East	5,252,649	14,425,752	13,828,204	11,778,350	13,212,805
Total E. Hemisphere	62,474,658	94,674,878	90,962,519	113,196,768	115,702,931
Total U. S. imports	205,434,917	233,011,089	242,214,766	294,279,800	349,764,542
U. S. crude oil demand	2,441,259,000	2,554,865,000	2,539,564,000	2,730,218,000	2,900,000,000
Imports† equiv., per cent	8.41	9.12	9.54	10.68	11.77

*Either of Iraq or Saudi Arabia origin. †Excluding Puerto Rico.

. . . And What U.S. Ports Handle the Flow

District—	1952	1953	1954	1955	1956
North Atlantic:					
Portland					77,761
Newport				406	1,622
Boston	5,404,700	3,764,000	4,897,710	5,885,774	6,425,966
Providence	1,556,519	1,002,729	684,837	788,356	832,108
Bridgeport	101,215	103,810			
New York	57,761,841	55,580,387	57,188,729	58,911,740	60,769,102
Philadelphia	116,550,959	129,371,437	139,675,930	160,311,336	161,763,345
Baltimore	5,331,233	3,993,672	7,926,064	7,485,831	5,911,572
Norfolk					1,298,495
Total North Atlantic	186,706,467	193,816,035	210,373,270	233,383,443	237,079,971
South Atlantic:					
Charleston	1,460,344	1,909,884	1,871,127	2,316,441	2,562,571
Savannah	2,123,955	1,617,978	2,364,313	2,368,290	2,211,949
Tampa		1,412,884	691,107	456,805	323,996
Total South Atlantic	3,584,299	4,940,746	4,926,547	5,141,536	5,098,516
Gulf Coast:					
Mobile	967,240	102,973	1,576,503	1,435,081	1,319,760
New Orleans			916,010	2,031,791	1,788,225
Galveston	1,227,591	2,555,457	2,532,953	9,328,483	10,768,594
Brownsville		290,380	1,479,953	1,252,867	207,976
Total Gulf Coast	2,194,831	2,948,810	6,505,419	14,048,222	14,084,555
Pacific Coast:					
Los Angeles	4,501,873	12,856,406	4,789,402	5,765,770	19,985,418
San Francisco	7,406,705	15,809,348	12,627,771	16,261,351	25,620,635
Seattle		21,500	1,296,136	11,640,250	20,339,116
Total Pacific Coast	11,908,578	28,687,254	18,713,309	33,667,371	65,945,169
Canadian Border:					
Rochester				12,000	
Buffalo	506	196		5,720	1,260
Great Falls, Mont.				85	132,328
Pembina, N. D.	508	441		254,145	982,568
Minneapolis					74,861
Duluth	1,039,898	2,617,607	1,696,221	4,897,359	15,327,430
Detroit				144,541	1,781,370
Total Canadian Border	1,040,912	2,618,244	1,696,221	5,313,850	18,299,817
Puerto Rico				2,725,378	9,256,514
Total U. S.	205,435,087	233,011,089	242,214,766	294,279,800	349,764,542

Import Policy Denounced

Independents launch attack before O'Mahoney probe; senator warns majors may be riding for federal control

WASHINGTON. — Domestic producers used the Senate oil investigation last week to launch an attack on imports.

They blamed any failure in the oil-for-Europe program on companies in the Middle East Emergency Committee. Imports of those companies have limited the domestic industry severely, they said. As a result, both transport and discovery of oil show signs of lagging behind requirements. *(For an up-to-date study of imports, see page 58).*

The investigating group headed by Sen. Joseph C. O'Mahoney of Wyoming filled out its bill of complaint against the international companies with testimony of the producers. Over a 4-week period it has probed the operation of the oil lift, increases in crude and product prices, and the monopolistic aspects of the Government-industry program for the relief of Europe.

This week the O'Mahoney subcommittee will call the M.E.E.C. companies to present their defense. *(An analysis of the M.E.E.C. appears on page 68.)*

Independents talk . . . A large group of southwestern producers and oil association officials were called to appear before the subcommittee.

They included W. A. Delaney, Jr., Ada, Okla., producer; Lester Clark, Breckenridge, Tex.; and P. R. Schultz, Tulsa, president of the Oklahoma Independent Petroleum Association, and Blackwell Oil & Gas Co. Also listed to testify were gasoline dealer and refiner spokesmen.

The group told the subcommittee that the Suez crisis proves that the U. S. will not have military security until enough oil to meet all needs is available "for immediate use" in this country and Canada.

The importing companies are not content with oil brought in from abroad, witnesses asserted. They are trying to dictate the policies of the state regulatory bodies. The aim is to get more oil from their own wells and buy less from independent producers, one witness said.

A charge that if the companies succeed the same situation will arise in other states that now exists in Wyoming brought prompt concurrence from O'Mahoney. Wyoming has neither production control nor ratable-purchase rule. But O'Mahoney agreed that the independent operators are treated better than they were some years ago.

Waterway a threat . . . Domestic producers stand to lose another big segment of their market in a few years if imports are not controlled, the subcommittee was told.

Completion of the St. Lawrence Seaway will open a great midwestern industrial area to foreign oil. That area now is supplied with Mid-Continent oil. But lack of import controls will make it a prime target for foreign oil.

The charges of the independent operators brought a warning from O'Mahoney that the major companies may be drawing "rigorous" federal controls on themselves.

The producers disavowed any desire for federal control, however. They expressed the belief that the industry can clean its own house. But a witness suggested that stiffening of the Sherman Act might help.

O'Mahoney agreed that an amendment banning any unified, concerted or unanimous act endangering the national security or imposing unreasonable restraint on trade might be sufficient.

Control bill ready . . . O'Mahoney pointed out that a bill to set up a national petroleum commission already has been introduced.

The proposed agency would regulate oil in much the same manner that the Federal Power Commission regulates gas. The senator, however, did not indicate any desire to substitute federal for state regulation.

Before turning to the producers' problems, the subcommittee heard The Texas Co. officials defend the recent price increases.

Increased costs over the past few years more than justify the higher prices for crude, James W. Foley, president of the company, said.

Levels still low . . . Government officials, meanwhile, are studying the effects of increased Texas production and refinery cutbacks on the lift to Europe.

There are signs that it may do no more than keep shipments around the 500,000-bbl. a day level aimed at under the relief program.

Much of the new oil, it was said, will have to go to rebuild stocks de-

Behind Closed Doors: Doing spadework for wage talks are these members of the Oil, Chemical, and Atomic Workers International Union. About 50 of the O.C.A.W.'s Sinclair nation-wide council met in Tulsa, just prior to a full-scale conference with Sinclair Oil Corp. officials in Kansas City, Mo. Addressing the workers is B. J. Schafer, Denver, vice president of the big 105,000-member O.C.A.W. The union wants a 27-cent-an-hour wage increase, and will probably press for some fringe benefits. Negotiations with Sinclair management started last week, and will affect 15,000 Sinclair employes. The talks may set the general wage pattern for the entire oil industry this year.

pleted in the first weeks of Europe's crisis. Some will be required to replace Venezuelan crude if shipments from the Caribbean are diverted from the U. S. to Europe.

Thousands of West Texas wells still are not connected to pipelines despite reports to the contrary, Texas producers said at the O'Mahoney hearings.

As production allowables go up, their position becomes even worse in comparison with that of operators linked to gathering lines. But if imports were kept down, there would be an incentive for building new gathering systems. Until that happens, these wells cannot be counted on for quick supply in case of an emergency.

Oil Funds Allotted

$454-million budget voted for interior oil activities

WASHINGTON. — Interior Department oil agencies stand to have more money to spend after July 1. But they won't get all they asked for, thanks to House appropriation committee action.

The department asked for a total of $515,189,700 for its work during the 1958 fiscal year. It has $458,135,000 for the current year. The committee, however, knocked off more than $60,000,000. It gave the department $454,395,700, subject to House and Senate action.

The committee pointed out that this $454,000,000 is not a drain on the Treasury. The department's leasing and other activities are expected to bring in some $437,000,000, of which $306,000,000 will go into the general fund. Revenues will cover two-thirds of the department's cost.

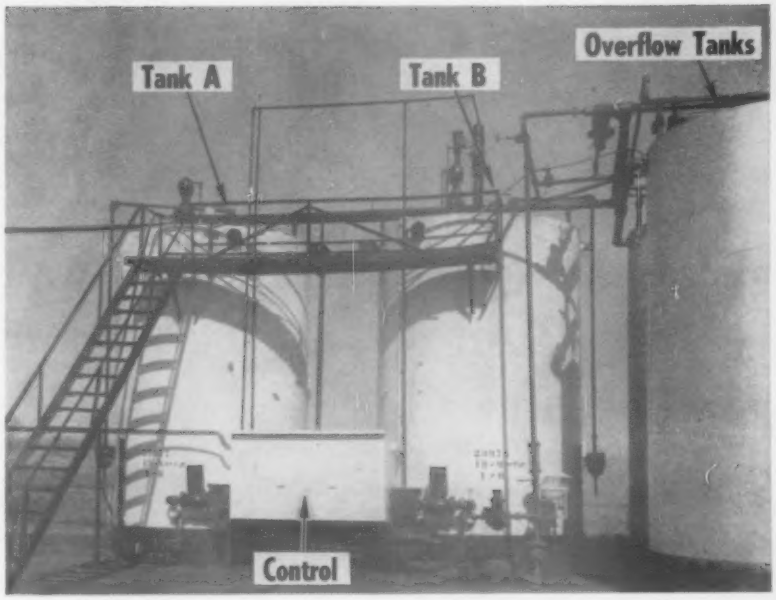
Who gets what . . . The oil and gas office fared best of the oil bureaus in the department. It asked for and was given $585,000, an increase of $71,200 over this year.

The Bureau of Land Management was given $22,000,000 for its leasing and other resources work. This was an increase of $3,630,700 over 1956.

The Geological Survey, getting $36,000,000, will have $4,398,000 more than this year's fund. But the committee pared $2,775,000 off its request.

The Bureau of Mines was given $18,700,000 for conservation and development, an increase of $2,837,250. This is $875,000 less than it asked.

The committee indicated it might have given the Geological Survey still more money except for the bureau's recruiting troubles. The survey has been able to fill only 117 of 628 open jobs.



TEXAS' FIRST automatic lease unit in Antelope field shows . . .

LACT Pioneer a Big Success

AUSTIN.—One of Texas' first two lease automatic custody transfer (LACT) setups will continue to operate for at least another 6 months.

The Texas Railroad Commission has extended Shell Oil Co.'s permit to tender oil automatically from its Hugh Henderson lease in Antelope field of Clay County, North Texas.

The Shell LACT unit and one proposed by Phillips Petroleum Co. in Panhandle field were put on trial status last summer *(The Oil and Gas Journal, July 30, 1956, page 122)*. The original 6-month permit ran out February 20.

Along with the extension, Shell also got the green light to install similar units on four of its leases in Wasson field of Gaines and Yoakum counties in West Texas.

And Pan American Petroleum Corp. (formerly Stanolind Oil & Gas Co.) got permits to install its version on its Dean "A" lease in Slaughter and Levelland fields in West Texas and on its Drake lease in Hastings field on the Texas Gulf Coast.

System proved . . . Shell told the commission its Antelope field unit had transferred to the pipeline almost 50,000 bbl. of oil in 291 tank dumps or runs since installed last October.

A Shell engineer said the company also has improved on the original design. He said Shell can now give the commission and the state comptroller three permanent and four daily, weekly, and monthly records on the unit.

The number of runs and oil volumes during the 6 months were verified by temperature-chart and tank-counter records. Shell said it provided still more check points during the 6 months by installing a predetermined run counter, a liquid-level recorder, and a positive-displacement meter.

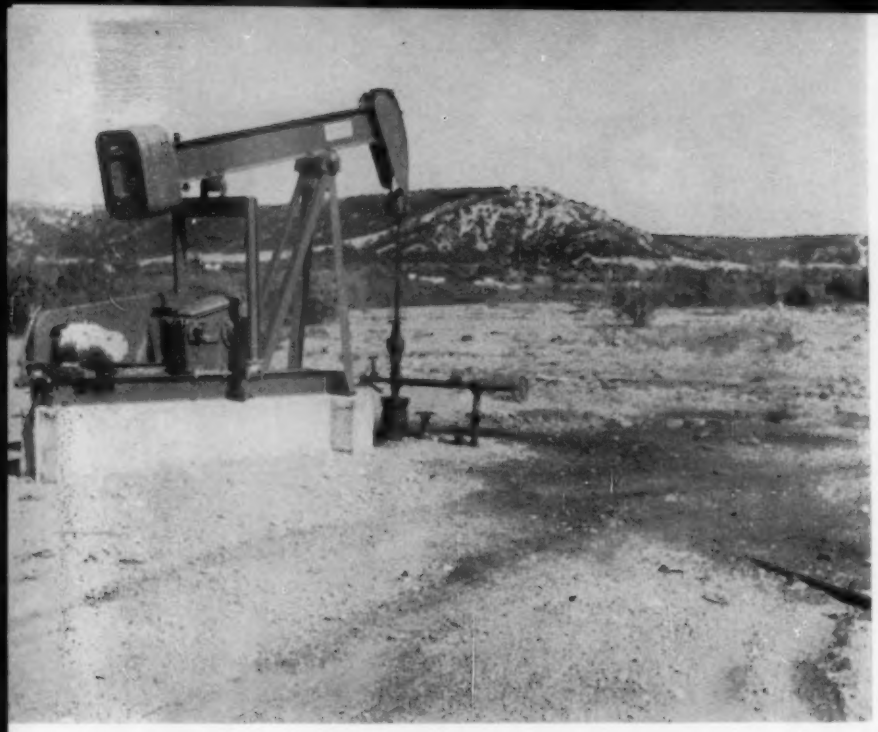
All check records, Shell declared, show that the LACT unit has tendered the lease allowables smoothly and accurately. Minor equipment failures during the test were spotted quickly due to the unit's fail-safe features. And each tank of oil was measured correctly before it was run to the pipeline.

On top of this, Shell said, the company has saved a significant volume of oil in that the crude was handled in a closed system and not exposed to evaporation and b.s. and w. losses which go with old-type storage and gaging.

Shell's opinion of the unit's success was seconded by that of the pipeline, Sinclair Pipe Line Co., which takes the oil. H. P. Buser, head of Sinclair Pipe Line's oil-movements department, said the unit had proved satisfactory and "will be valuable in conservation and efficiency in running oil from the lease."

Shell earlier estimated that the LACT unit on the Henderson lease would save it about 32 bbl. of oil a month.

It figured that Texas would save about 26,900,000 bbl. of oil each year if similar systems were applied to 60 per cent of the state's oil production.



Lonely unconnected wells, like this one in Taylor County, are reasons why . . .

Battle on Pipelines Brews in Texas

AUSTIN.—Common-carrier oil trunk lines in Texas are facing a showdown this spring on the thorny problem of unconnected wells.

The Texas Railroad Commission has kicked off the fight. It has ordered the pipelines by March 11 to submit a mountain of data on crude-oil gathering and transmission activities, ownership, costs and profits, past and planned expansions, and more.

The action is preliminary to an April 1 hearing which may ignite one of the most bitter battles yet between importers and independent producers. On that date, the Railroad Commission has directed the pipeline operators to appear and show cause why they should not be compelled to:

. . . **Expand capacity** of their lines from North and West Texas to the Gulf Coast so as to take to market all oil which could be legally produced in these areas.

. . . **Extend gathering systems** to connect all wells in each line's operational area.

. . . **Reconvert to crude service** any products line which has been converted without a commission permit.

What's behind move . . . The commission called the April 1 hearing after study of a petition submitted by several groups of independents in January.

The producers which fought for the hearing are well organized. The petition was signed by the West Central Texas Oil and Gas Association, East Texas Oil Association, Texas Independent Producers and Royalty Owners Association, North Texas Oil and Gas Association, and the Panhandle Producers and Royalty Owners Association.

As the deadline neared, Magnolia Petroleum Co. announced it will expand its crude capacity out of West Texas by 75,000 bbl. a day. Magnolia will loop portions of its main line from Midland to Beaumont and add pumping capacity.

Production throttled? . . . The producers charge that the major crude buyers, through their ownership of the trunk lines, are choking back Texas oil production to make way for more imports.

Their petition says six major purchasers control and/or operate all pipelines carrying crude from West Texas to the Gulf Coast. Named were Gulf Oil Corp., Humble Oil & Refining Co., Shell Oil Co., The Texas Co., Atlantic Refining Co., and Magnolia.

All these companies, the producers point out, are large importers either directly or indirectly through affiliates.

The producer group says that pipeline owners have failed to boost line capacity or throughput to the Gulf Coast to handle "increased and increasing production." They charge that this is deliberate—that the buyers use lack of capacity and demand as an excuse for buying selectively and for not taking on new connections. New demand then is met with imported oil.

Rules violated . . . The independents say the majors owning the lines thus are directly violating the state's ratable take and waste-prevention statutes.

As evidence, they submit that:

. . . **More than 8,000 wells** are without pipeline connections in Texas. Some of them in fields where other wells are connected. The big majority of the 8,000 cannot be rejected by the pipelines on grounds that the connections wouldn't be economic, they say.

. . . **Oil trucking is up.** Figures show that 41 per cent more oil was trucked in September 1956 than in September 1955. The total trucked last September was 2,980,978 bbl.

Trucking charges range up to 45 cents a barrel. This, independents charge, means that the trucking producer gets this much less for his oil than the producer who is connected to a pipeline. It also means waste because the trucking producer must abandon marginal wells much sooner and otherwise economical water floods may never be started.

The producers claim that trucking itself is wasteful, too. They argue that more than 5 bbl. of crude is lost through evaporation and b.s. & w. contamination for each 100-bbl. truck load.

. . . **Pipelines are retiring capacity** illegally by converting crude carriers to products service without commission permits as required by Texas law.

They cite examples where a producer in order to get a pipeline connection

A Pipeliner's Quiz Sheet

HERE'S the information the Texas Railroad Commission has ordered common-carrier crude pipelines to furnish by March 11.

1. Map of the entire system showing:
. . . Entire trunk-line system giving location and size capacity, location of pump stations and sizes of each, dates of each installation, and location of connections with other gathering systems and trunk lines.
. . . Increases of capacity of throughput or pumps with location and date of installation.

2. Map of gathering systems showing:
. . . Gathering system and the wells in each field which the system serves. The exact location of all wells to which the system is connected shall be given along with the lease name, operator, and date of connection.
. . . The location, lease name, operator, and date of completion of all wells without pipeline connection with any field served and the location, lease name, and operator of all wells without pipeline connection that are nearer reporting company's line than any other crude-oil line.

3. Statement of ownership, giving percentage of all persons owning more than 5 per cent, giving date of incorporation and time carrier began operating.

4. Financial statement for the years beginning January 1, 1948, through last fiscal year. It shall show by balance sheet the gross assets, reserves for depreciation, liabilities, capital, and earned surplus.

5. Statement of dividends paid since 1945 with names of those who received them and the amounts.

6. Profit and loss statements for each year since January 1, 1948, showing gross income, depreciation, largest expenditure and net income.

7. Cost-per-mile statement covering installation of entire system. This shall show cost-per-mile of trunk lines, gathering systems, and recent extensions; dates of such expenditures with breakdown on costs of right-of-way, pipe, installation, and pumps.

8. Statement on expansion of capacities since January 1, 1952, giving the location, date of installation, increase in capacity, and method of effecting it.

9. Statement of planned enlargements of capacities giving anticipated locations, dates of installation, capacity, and method of effecting it.

10. Map locating any crude line converted to a products line. It shall show date of conversion, size and crude-oil capacity of the line plus the trunk line, gathering systems, or wells and refinery to which it was previously connected.

11. Statement whether permission of the commission was sought and obtained to make the conversion.

12. Estimated cost of increasing capacity of each trunk line by 20, 40, 60, 80, and 100 per cent and how this could be effected in each case using the most economical method.

13. Furnish chart for each trunk line showing percentage of capacity carried in each of last 12 months compared with total maximum capacity each month. Chart also shall show maximum capacity that could be carried if pumping stations were enlarged or added.

has had to pay the cost of the gathering line out of oil while the pipeline operator retained ownership.

What can the commission do? . . . Does the Railroad Commission have the power to order a common-carrier oil trunk line to expand its capacity or extend its gathering system?

The independents say it does. They cite Texas statutes to prove the point.

One of these, Article 6049-A, Section 7, V.C.S., gives the commission the power to order a common carrier to extend or enlarge its system if:

. . . The extension or enlargement is "reasonable."

. . . It's "in the public interest."

. . . It is not so expensive as to impair the common carrier's duty to the public.

Section 11-D of the same article provides that the commission can inquire into each field to see if any common purchaser is discriminating against any producer by withholding a pipeline connection. If the agency finds such discrimination, this section instructs it to order the common carrier to make any reasonable extension of its lines to relieve the situation.

Another section instructs the commission to prevent unreasonable discrimination in favor of one pool as against another or to end it when detected.

How about the pipelines? . . . The pipeline operators, for the most part, have turned the entire matter over to their legal departments.

None has commented officially. But the general attitude is one of surprise that the commission even considered the charges seriously, let alone called a show-cause hearing based on them.

An official with one of the firms said no one can order a company to "lose money" and make it stick. This would imply at least that this company and probably others would go to court if ordered, for instance, to expand its line capacity when it couldn't justify it economically.

The same official said his firm couldn't possibly assemble all data demanded by the commission in the allotted time. He hinted that the company wouldn't attempt to do it.

There are indications that several of the pipelines will issue statements prior to the hearing. At least one intends to do so before March 11.

Companies ordered to furnish data and appear to testify at the show-cause hearing include: Humble Pipe Line Co., West Texas Gulf Pipe Line Co., Shell Pipe Line Corp., Service Pipe Line Co., Atlantic Pipe Line Co., Magnolia Pipe Line Co., Rancho Pipeline System, Texas-New Mexico Pipeline Co., and "all other common carriers of crude having trunk lines running through or originating in the North, West, and West Central districts (of Texas)."

Producers on spot too . . . The commission revealed late last week that testimony from producers will open the April 1 hearing.

But the commission will force each producer appearing to prove his complaints about unconnected wells. He must state:

. . . Location of each unconnected well.

. . . Identity and location of pipeline to which he wants to be connected.

. . . Daily output of each well as last reported to the commission.

. . . Total production of operator's unconnected wells.

The operator also must state under oath just what efforts he has made to help himself get his wells connected. This means he must divulge all letters, telegrams, telephone calls, or personal interviews with pipeline personnel in his efforts to get connected.

The operator must tell the commission, too, whether he wants to sell his oil or merely move it. The commission pointed out that there is a distinct difference between the two. Its powers over common-carrier lines are different from those it has under the Common Purchaser Act.

Oklahoma Allowable Hiked

OKLAHOMA CITY. — The Oklahoma Corporation Commission has increased the state's production allowable for March by 10 per cent, boosting the per-well minimum from 28 to 31 bbl. daily.

The new allowable is expected to result in production of 640,000 bbl. daily during the month, a 10,000-bbl. daily boost over February. The 10 per cent increase will increase production from 6,000 to 7,000 bbl. daily. The remainder will be allocated to new wells and to operators with under-production.

Gov. Raymond Gary had suggested a 25 per cent increase in March allowables. But conservation officials decided that the recent increase in Texas' production reduced the demand for Oklahoma oil and made a larger hike unrealistic.

Western Oil Dwarfed

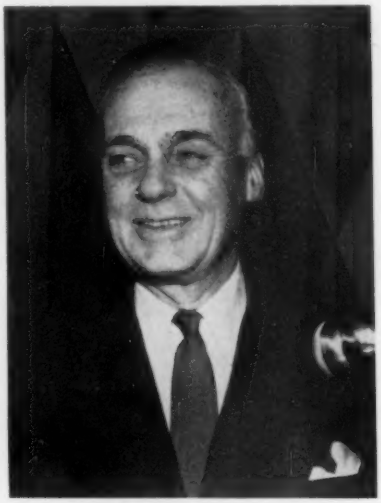
● Time may come when Americas will depend on access to Middle East oil, Socony's Jennings tells A.I.M.E.

NEW ORLEANS. — "Though the Western Hemisphere is self sufficient in oil at present, we should not be complacent about our reserves for the future."

This warning came last week from B. Brewster Jennings, chairman of the board of Socony Mobil Oil Co., Inc.

"The day may come when the Americas will be dependent on access to Middle East oil," he told the American Institute of Mining, Metallurgical and Petroleum Engineers.

"Disregarding the possibility of getting oil from shale or from tar sands, the facts suggest," he said, "that if present trends persist, the Western Hemisphere will run out of oil before the Eastern Hemisphere does."



B. BREWSTER JENNINGS
. . . "we'll run out of oil first."

There's still oil . . . Jennings conceded that many billions of barrels of oil may still lie hidden in stratigraphic traps in this country.

"But so far as orthodox structural features go," he added, "we may well be getting to the bottom here, whereas in Iran, Iraq, Saudi Arabia, and other countries in that great oil area, we have far from exhausted the possibilities of finding more oil even using present-day methods."

He warned that "the odds against finding another oil province on this earth comparable to that around the Persian Gulf are too great to make such a hope a sound basis for the free world's long range planning."

The Socony executive pointed out that oil reserves in the United States and Venezuela are being drawn on five to seven times as fast as those of the Middle East. Last year U. S. petroleum production amounted to 8.1 per cent of domestic proved reserves. Venezuela produced 6.8 per cent of its proved reserves. But in the Middle East production was only 1.3 per cent of reserves.

Forecasts indicate that some time between 1965 and 1975, if not sooner, the free world will need twice as much oil as it uses today.

Drilling picture . . . Although it is presumed that most of the "conspicuous structures" in the U. S. have been tested, relatively little has been done in the Middle East. Results to date indicate the Middle East is a much better hunting ground than the Western Hemisphere. For instance:

. . . 1,683,000 wells have been drilled in the U. S. since completion of the Drake well 98 years ago this summer. Those wells have proved up 94 billion barrels of oil. Some 58 billion barrels of this have been produced.

. . . 18,000 wells have been drilled in Venezuela. They found 21 billion barrels of petroleum of which 8 billion barrels have been consumed.

. . . Fewer than 1,500 wells have been drilled in the Middle East. Yet proved reserves total at least 105 billion barrels.

"That is 11 billion more than we have managed to prove up in the United States with 1,000 times as many fields." Jennings said.

. . . Average output for an oil well in the U. S. is 12 bbl. daily compared to 5,000 bbl. daily in the Middle East.

"It is perhaps more dramatic," Jennings added, "to point out that it has taken a mile of hole in this country to prove as much oil as 5 ft. of hole have found out there."

Ticklish spot . . . Jennings pointed out that continued access to Middle East oil involves not only our relations with producing countries but with several nonproducers.

Syria, Lebanon, and Jordan, though nonproducers, can disrupt pipeline transportation from the area. Egypt, with relatively little oil production, already has halted flow of oil through the Suez Canal.

He suggested two "broad approaches" to safeguard the flow of Middle East oil, especially to Europe:

. . . Establish and maintain relations with the Middle East countries that they will not arbitrarily deny their oil to the free world.

. . . Disperse operations to include such possibilities as building more pipelines, construction of large tankers to go around the Cape of Good Hope, and keeping more oil in storage in consuming countries.

Such safeguards, Jennings said, are being considered by oil men and by governments in all parts of the free world.

"Whether industry alone should, or could pay the whole bill of providing these safeguards is a question still to be resolved," he said. "It would not be unreasonable to expect governments to absorb some of the cost of standby facilities that exceeded commercial requirements."

Gulf Adds New Gas

Third-grade superpremium may invade another area

THIRD grade superpremium gasoline will invade a vast new marketing area if Gulf Oil Corp. puts its new Gulf Crest in stations throughout its territory. The result could be a tightening of the octane race.

Gulf announced in a surprise move that it was going the third-grade route instead of beefing up present premium gasoline.

New purple pumps for dispensing the new Gulf Crest gasoline will start cropping up within a few weeks. By early spring, Gulf expects to be marketing the superpremium through much of its territory.

The Gulf announcement wasn't specific, but reportedly the company plans to carry the third-grade program throughout its marketing area.

At present, Gulf markets in 39 states and the District of Columbia. It has no pumps in Washington, Oregon, California, Idaho, Montana, Nevada, Utah, Wyoming, and Arizona. The company is moving to expand markets in the Northern Plains states. It has statewide market coverage throughout the East, Gulf Coast, and most of the Upper Mississippi Valley and Great Lakes regions.

Octanes and prices . . . Gulf is keeping silent on both these counts.

Like most others in the third-grade field, Gulf is not talking about octane numbers. However, officials say the new grade is the finest available for the new high-compression cars. It is gen-

erally conceded that it rates in the 100-plus range on research octane.

Price of the new superpremium also is an unknown. Officials decline to say what spread will be set between the premium grade and the new third grade. Other unanswered questions are: Where will marketing begin? And how widespread will it become by spring?

Other sources report Gulf may put the first Gulf Crest pumps in the Great Lakes area.

Reserves Increased

Canada's proved oil reaches 3,129,304,000 bbl.

CALGARY. — Proved petroleum reserves in Canada rose to 3.129 billion barrels in 1956, an all-time high.

The annual report of the Reserves Committe of the Canadian Petroleum Association noted the gain in reserves was achieved in spite of a record high production during the year.

The proved reserves increased by 373 million barrels for the year and now stand at:

. . . 2.849 billion barrels of crude oil.

. . . 280 million barrels of natural-gas liquids.

The biggest change in reserves during the year came from extensions of known fields which brought new oil and from revisions of previous estimates. This source accounted for 460,966,000 bbl. Another 48,191,000 bbl. was proved by discoveries in new fields and in new pools in old fields. The gains, however, were offset by 169,321,000 bbl. production in Canada for the year.

These reserves, according to the report, represent proved recoverable petroleum in the ground. Their location and extent have been established by the industry's continuous drilling program. The reserves were determined by analyzing new discoveries, extending known pools and revising previous estimates.

CANADA'S PROVED RESERVES
(Thousands of barrels)

Area—	12-31-55	12-31-56
Crude oil:		
Northwest Territories	53,707	53,258
Alberta and British Columbia	2,169,985	2,391,778
Saskatchewan	236,872	358,693
Manitoba	45,211	42,005
Ontario and New Brunswick	3,759	3,636
Total crude oil	2,509,534	2,849,370
Natural-gas liquids*	247,085	279,934
Total liquid hydrocarbons	2,756,619	3,129,304

*All natural-gas liquids located in Alberta and British Columbia.

Forced Drilling Units Sought

AUSTIN.—A bill which would permit the Texas Railroad Commission to force an operator to join a drilling unit is now before the Texas Legislature.

The bill would permit such action if the commission should find it was needed to:

. . . Prevent waste.

. . . Protect correlative rights of owners of mineral interests.

. . . Avoid drilling unnecessary wells.

The bill was introduced in the House of Representatives by Rep. Richard Slack of Pecos. It likely will be referred to the house oil, gas, and mining committee.

In a drilling unit, operators pool adjoining leases and drill and produce them as a unit. The total acreage thus can be developed and produced more efficiently with fewer wells. It eliminates, for instance, the need to drill against lease lines as protection from drainage by other wells.

Aimed at small tracts . . . Under current Texas law, an operator can drill a well on any tract, no matter how small. And field allocation formulas seldom are based on acreage alone.

More often they are based partly on acreage and partly on the well. With this situation, an operator with a well on a 1-acre lease can produce more than half as much as one with a well drilled on a 40-acre lease. This is true even if the wells are equally productive.

The 1-acre operator seldom can be prevailed upon to join a drilling unit voluntarily because his oil take would be reduced. To keep oil from being drained from his lease, the 40-acre operator often has to drill uneconomic wells on his lease line to offset the 1-acre well. In fact, he can be sued by his royalty owners if he doesn't.

Reports are that the Slack bill is directed primarily at righting this situation.

Other bills . . . The house has passed and sent to the senate a bill making it a felony to steal geophysical maps and charts or to copy them without authorization.

Another bill in the house would convert Texas' water pollution advisory council into a formal board, the Texas Stream Pollution Control Board. The board would have the power to control the amount of pollution permitted to enter streams. It would consist of members of five state agencies now working in the field of pollution, plus three public members.

Still another bill would make cities pay all costs when they use the power of eminent domain to force relocation of pipelines, utilities, highways, or railroads.

'International' Tidelands Feared

NEW ORLEANS. — If Louisiana's claim to the tidelands is not upheld, there's a threat that the so-called federal area eventually will be internationalized, according to John Hussey, Louisiana conservation commissioner.

In an address at the annual meeting of the A.I.M.E., Hussey reminded the group that U. S. planes have been shot down much closer to foreign shores than some producing wells in the Gulf of Mexico are to the U. S. mainland.

The commissioner said Louisiana's claim to the submerged area off the coast is based on the "historic boundaries" of the state. The Louisiana Purchase of 1803 included all the French terrtory south of the thirty-third parallel. The same description was used in defining Louisiana when it was admitted to the union.

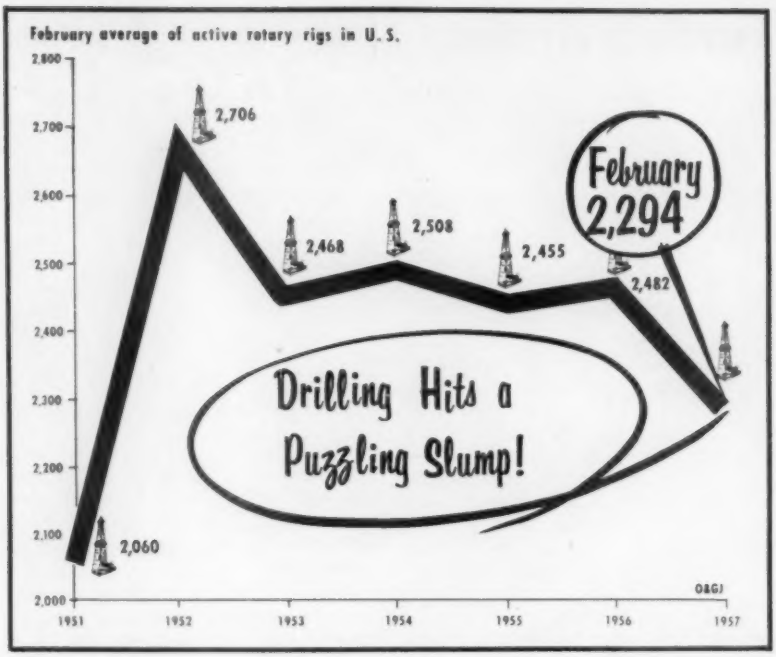
Louisiana claims its gulf boundary extends 10½ miles from the coast. But the "coastline," as defined by a 1954 state law, extends as far as 35 miles into the gulf.

The U. S. claims oil rights on the entire Continental Shelf beyond the 3-mile limit off Louisiana. The dispute is now pending before the U. S. Supreme Court.

Recognition of Louisiana's claim actually would strengthen the U. S. claim, Hussey argued. Otherwise, there's a real threat of internationalization of much of the shelf "because if it's ouside of Louisiana, it's outside of the United States."

Hussey also indirectly supported Texas' right to submerged lands as far as 10½ miles from shore. When Texas entered the union, he said, it did not cede its public lands to the federal Government.

He pointed out that the Continental Shelf normally extends less than 3 miles seaward from the Atlantic and Pacific coasts. But off the Gulf Coast, the shelf extends as much as 125 miles.



Operators ask:

Why Is Drilling Off?

THE drilling business is looking like a mongrel in a blue-ribbon dog show.

Elsewhere in the industry things are looking prosperous. Demand is at an all-time high. Crude-oil prices have just gone up. Together, demand and prices make 1957 look like a record year for oil.

But drilling is another story. First-quarter rig activity is lower than in any similar period in the past 6 years (chart).

Active rigs in the U. S. in February averaged only 2,294—188 fewer than a year ago. February completions totaled about 4,000—615 under February 1956.

Last week oil men were asking themselves—and each other—just what was wrong. As one drilling contractor put it: "We all predicted 1957 would be a good year. We still assume it will. But we thought it would be good sooner."

Why is drilling off? Most operators don't know. There are almost as many answers as oil men. Here's what most blame:

1. **Tight money.**
2. **Political uncertainty.**
3. **Offshore and foreign operations.**

The money problem . . . Money is harder to get, and interest rates are up. This makes adequate working capital a problem for some companies. Independents are bothered more than the large, integrated companies, but both are affected.

"It's now becoming fashionable to save your money," quipped an official of a large integrated firm.

Because of the tight money market, his company had ordered a cut in spending during the first quarter. He said drilling will pick up in the second quarter, but he implied that the company is not expecting a big first half.

The political picture . . . Congressional investigations, fears for the depletion allowance, and uncertainty over the future of natural-gas regulations are having a depressing effect.

In many cases operators associate the dip in drilling activity with Washington confusion over the recent price hike. The critical testimony before both House and Senate committees caused a national stir.

Some operators are quietly fearful that the price increase won't hold. Most scoff at the idea that it will be rolled back. But the confusion and the price worry prompted one oil man to remark that "companies are holding back on expenditures till they find out more."

Offshore and foreign . . . More and more money is going into activity in the gulf and in exploration programs abroad.

There were 116 rigs working off the Gulf Coast last week—mostly off Louisiana. This is a dozen more than the number active in early December.

These wells are deep and expensive. Some cost as much as a million dollars.

One major-company vice president said he didn't know just how much money he could spend for exploration in his division—including the Mid-Continent, Rocky Mountains, and Canada—until he found out how much would be left over after his company made its offshore allocations.

Costly Venezuelan concessions are attracting big money from international companies, and some independents as well. Some operators think this may be pulling away some of the capital from inland U. S. development.

The president of one big contracting firm said the stepped-up interest in exploration throughout North Africa and Europe may take still more money away from U. S. operations.

Where drilling is off . . . Virtually all of the cut is in development work.

Wildcat completions totaled 2,027 through February 23 this year. This figure is 26 higher than the total for the first 8 weeks of 1956.

But only 6,144 development wells had been drilled this year during the same period—compared with 6,849 in 1956.

Geographically the biggest slumps in activity have come in Oklahoma, Kansas, and Illinois. Not affected are East, West, and North Texas, and Texas Panhandle, North Dakota, Arkansas, and the Four Corners area.

The downward trend in Oklahoma and Kansas is not new. For one thing, marginal drilling in old fields has passed its peak and is declining. The emphasis is now on deeper, more costly development in the western areas of the two states.

One Oklahoma independent puts some blame for the drop there on state allowables. A good, deep well is allowed only 60 or 70 bbl. a day. "At a cost of a couple hundred thousand dollars per well," he said, "that's not a very big allowable."

In the Illinois basin, a new play is needed to spur drilling. Without it, activity may continue to drop. Unusually wet winters in both Oklahoma and Illinois were credited by some with postponing scheduled wells.

Completions also were down in Southwest Texas, the Texas Gulf, and in Louisiana, except for offshore operations.

Other factors . . . Here are some other thoughts of oil operators on what caused the drilling slowdown:

. . . Higher steel prices. They went

up again in February *(The Oil and Gas Journal, February 18, page 106)*. It's just one of many spiraling costs which affect drilling.

. . . **Deeper drilling.** One firm with 21 rigs said its average well depth this year is between 9,200 and 9,300 ft., compared with 9,000 ft. last year. Added costs here might affect total completions.

. . . **Imports.** Many independents foresee a new surge of imports when the Suez Canal is opened again (see page 52). Fears of future cuts in domestic production may be holding down present drilling.

. . . **Oil for Europe.** The drive to keep fires in the furnaces of Europe has halted some drilling, one oil man reported. In some cases, he said, rigs have been pulled off development programs to perform workovers on wells connected to a pipeline to the Gulf Coast.

What's ahead? . . . In spite of the many answers, no one was sure last week just how to diagnose the drilling industry's ailment.

"The slump is not too alarming yet," said one observer, "but it would be if it were to continue another month."

Most doubted the illness would last. After all, the best medicine—strong demand and a higher price—already was on hand. And, in the long run, as one optimist said: "A price hike won't slow activity down. That's for sure!"

Phillips Hits in Block 172

MORGAN CITY, La.—Phillips Petroleum Co. has found prolific gas and condensate production in a deep wildcat in the Gulf of Mexico, 38 miles off Saint Mary Parish.

It is on the company's Dome "B" prospect, in Block 172, Eugene Island area. It is about 1¾ miles northwest of the discovery well, completed a year ago, of Dome "A" field in the adjoining Block 184 on the south.

Calculated open-flow potential of the Dome "B" strike is 80,000,000 cu. ft. of gas and 1,440 bbl. of 47°-gravity condensate per day. Flow through ¼-in. choke tested 9,000,000 cu. ft. of gas and 18 bbl. of condensate per day with pressure of 5,730 psi.

Production is from a 20-ft. interval at 14,369-89 ft. in the upper part of a 105-ft. sand. Total depth is 14,584 ft. Six shallower oil or gas zones, aggregating 119 ft. of sand, were logged but not tested.

Discovery well on Phillips' Dome "A" field was rated good for 65,000,000 cu. ft. of gas and 1,300 bbl. of condensate daily, open flow, from pay at 14,808-36 ft.

TOP GEOLOGISTS swap opinions on the Rockies' possibilities. Left to right are A. I. Levorsen, Tulsa, consultant, keynote speaker, and former A.A.P.G. president; Graham B. Moody, Los Angeles consultant and A.A.P.G. president-elect; Theodore A. Link, Calgary consultant and A.A.P.G. president; and Frank Neighbor, Salt Lake City, president of the A.A.P.G. Rocky Mountain section.

Look for Traps, Levorsen Says

SALT LAKE CITY.—"Trap thinking" must replace structural thinking if the great oil and gas potential of the Rocky Mountain region is to be realized

This was the discovery challenge hurled at Rocky Mountain oil finding by A. I. Levorsen this week. The noted Tulsa geologist delivered the keynote speech to the seventh annual meeting of the Rocky Mountain section of the American Association of Petroleum Geologists. Some 2,000 delegates attended the 3-day session here.

"We must drill more wells, obtain more logs, and make more maps before we can begin to appreciate the great possibilities of the western regions," Levorsen said.

Exploration for petroleum, he pointed out, generally follows a recognizable sequence or pattern that consists of three phases. Phase 1 is exploration for purely structural traps. Phase 2 attacks combination structural and stratigraphic traps; phase 3 is exploration for purely stratigraphic traps.

"It would appear from the theme of this meeting," Levorsen said, "that Rocky Mountain geologists feel they may be moving out of phase 1—the structural period—into phases 2 and 3, the periods of increasing stratigraphic importance.

"This is but a normal development. It has been delayed somewhat in the Rockies because of the large original supply of structures. We should remember, however, that running out of structures does not in any sense mean running out of oil."

Exploration for stratigraphic traps, according to Levorsen, means a change in geologic thinking, a much greater emphasis on precise geologic data, more imagination, and more courage to drill more wells into the less obvious traps.

Pointing to Cretaceous stratigraphic traps in northwestern New Mexico, such as Bisti, and to Canada's greatest, the Pembina field, Levorsen emphasized his belief that untold numbers of similar Cretaceous reservoirs must lie undiscovered in the vast area between them.

"We are entering a new era," he said, "in a region possessing the most complete geologic section in North America; these formations are all thick, and all are productive at one place or another. But the low drilling density in the Rockies still clouds the potential of the region. The great amount of oil already found with a relatively small amount of drilling, indicates vast undiscovered reserves there."

To some, Levorsen concluded, the golden years of petroleum in the Rockies are in the past, but to others, with equal logic, the golden years are still ahead.

Just What Is the M.E.E.C.?

ITS OBJECT:

Advise the Government on foreign oil.

ITS ROLE:

Plan, coordinate, expedite action in the emergency.

ITS POWERS:

It can recommend a course of action to the Government. If approved, it can then recommend that oil companies cooperate. Every move is subject to check by the Government.

ITS SUCCESS:

Helped move an average of 902,000 bbl. daily of petroleum to Europe from the Western Hemisphere in December and January. Is working toward 100 per cent fulfillment of Europe's needs.

ITS FUTURE:

Depends on the Government, which can shut it down at any time. But in Washington and elsewhere it has become . . .

Whipping Boy in a Crisis

ONE of the mysteries of the Suez crisis is the little understood role of the Middle East Emergency Committee.

The public is being led to believe the M.E.E.C. is a cloak and dagger organization. It's being associated with a dark oil conspiracy. It's labeled an instrument of "big oil" to achieve a monopoly, or to raise prices.

Why this outcry?

It's difficult to understand in view of the organization's phenomenal success. Under its planning the oil industry has averaged sending 902,000 bbl. daily additional oil to Europe. The actual shortage caused by Middle East hostilities was slightly more than 1,000,000 bbl. daily. The industry now is trying to erase all of this deficit.

Restricted role . . . Creators of the M.E.E.C. gave it only a limited role.

Here's how it has fitted into the Suez crisis:

. . . It was set up originally as a planning agency instructed to draw up program of action in case Suez was closed.

. . . It was shut down completely for a month after the canal actually was closed and the Iraq pipeline cut in Syria.

. . . It was revived to help in the oil lift early in December but under the supervision, direction, and control of the Government.

What industry did . . . Reasoning behind shutting down the committee is understandable.

The Government figured that any actions of the committee would be misunderstood abroad. It was feared unwarranted inferences about U. S. policy might result. Also officials feared that committee actions might compromise the U. S. position in the United Nations, then embroiled with the crisis.

During the month that M.E.E.C. was suspended, oil companies, entirely voluntarily, shipped an average of 623,000 bbl. daily of petroleum to Europe. This consisted of:

. . . 239,000 bbl. of crude from the U. S.

. . . 160,000 bbl. of products from the U. S.

. . . 84,000 bbl. of crude from the Caribbean.

. . . 140,000 bbl. of crude from the Middle East that had been diverted from the U. S.

The companies achieved this record acting separately and on their individual initiative. But in doing so they acted with the full knowledge and encouragement of the federal Government.

They rerouted tankers, redistributed crude and product supplies, shifted refinery patterns, increased Latin American production, speeded up pipeline construction, reversed lines, and reactivated many not in use.

The 623,000-bbl. daily figure actually represents a greater achievement than it indicates. The figure is for the month of November. But the oil lift didn't get started until the second week of the month. The average movement in the last 3 weeks of the month was nearly one-third higher than the monthly daily average.

The problem . . . Here's what the industry faced when the canal was blocked October 31 and the pipeline dynamited November 3:

. . . 1,650,000 bbl. daily of oil moving through the canal blocked.

. . . 825,000 bbl. daily lost through the pipeline.

Of this, 2,100,000 bbl. daily was going to Western Europe; and it represented two-thirds of that region's petroleum needs. It was lost virtually overnight. Tankers sailing around the cape could haul only about half this oil. That left a deficit of more than 1,000,000 bbl. daily to be made up from the West.

The M.E.E.C. plan . . . The emergency committee put into execution a plan designed to give Europe a total of:

. . . 579,000 bbl. daily more oil from the Western Hemisphere by pushing shipments up to 1,201,000 bbl. daily.

. . . 323,000 bbl. daily of Middle East oil diverted from the U. S. This is made possible by increased production in the Western Hemisphere.

In addition to this 902,000 bbl. daily, 80,000 bbl. daily was sent to West Africa and the Atlantic islands, largely for bunkering purposes to help ships going around Africa.

Federal strings . . . This plan, set up after the M.E.E.C. was reactivated December 3, was approved by Interior Secretary Seaton on December 7.

He first satisfied himself that:

. . . It was reasonably calculated to reduce Europe's shortage.

. . . It would not cause a shortage in the U. S.

. . . It was in the public interest.

The secretary's approval of the plan is typical of close governmental control affecting M.E.E.C.

Meetings can be called only by the Government. The agenda for each meeting is prescribed by the Government. All meetings are open to representatives of any government agency. A full-time, salaried representative of the Government must be present at each meeting, and the minutes of all meetings must be certified by the government representative to be full, complete, and accurate.

Representatives of the Department of Interior were present at all meetings. Frequently they were joined by representatives of the Departments of Justice and Defense, and the Office of Defense Mobilization.

Despite the high status of its watchdogs, the M.E.E.C. itself has no administrative power. It cannot allocate. It cannot make purchases, nor can it direct a company or an individual to take any action. It is purely an advisory organization. Its purpose is to make recommendations that will take advantage of the greater flexibility of

the industry as a whole as compared to that of each company.

How it was born . . . Seizure of the canal by Egypt's Nasser on July 26 led to creation of M.E.E.C.

Secretary Seaton, at the direction of Defense Mobilization Director Flemming, asked the Foreign Petroleum Supply Committee to set up a plan of action in the event normal shipments of Middle East crude were disrupted. The plan was approved August 10 and M.E.E.C. came into being.

The agency was to be composed of representatives of companies engaged in foreign oil operations. These companies were to staff the agency. It was empowered to:

. . . Make surveys, obtain and analyze information on foreign oil operations.

. . . Estimate petroleum needs of each foreign country, spot supplies available, and recommend schedules for each country or area.

. . . Recommend stocks to be maintained in friendly nations, especially the amount of oil stocks for military use.

. . . Recommend a program of action in event of a substantial stoppage of Middle East oil transportation.

Its legal standing . . . There is ample legal background for M.E.E.C.

The Defense Production Act of 1950 authorized the President to consult with representatives of industry to make "voluntary agreements" that would enhance U. S. security.

In 1953 ODM set up a Voluntary Agreement Relating to Foreign Petroleum Supply. It asked U. S. companies operating abroad to participate. The agreement was amended in 1954 and 1956. A similar agreement was in effect during the Iranian crisis in 1951-1952.

The express purpose of the agreement was to enable the Government to have access to information on foreign oil operations and have available an agency to help meet any emergency affecting oil supplies to the Free World.

The outlook . . . Life of M.E.E.C., like its beginning, lies at the option of the Government.

The committee and its plan of action were developed to meet an emergency. It can be terminated whenever the Government decides.

At present M.E.E.C. is tightening its plan of action to remove the last vestige of shortage, if possible. It is cooperating with the 17-nation Organization for European Economic Cooperation and the latter's oil advisory group.

When the emergency is ended, the agency likely will go back on the shelf.

watching WASHINGTON

. . . with Bertram F. Linz

Lines Forming for Gas Battle . . .

A NEW gas bill is expected to come before Congress soon. It will have the backing of a large part of the industry. And members from the producing states will work for it.

But signs point to a stiff fight on the House and Senate floors. Members from the consuming states are as strongly against the present bill as they were when the proposal was up before in the shape of the Harris bill.

There is a good chance that federal control of independent producers will be eased, if not wiped out. The Federal Power Commission made some good suggestions along that line last month.

More important, FPC officials have said several times that they cannot regulate producers under a law to regulate pipelines. The public-utility concept on which that law is based won't work when applied to independent operators whose only concern is to get gas out of the ground and sell it for enough to keep them in business.

The lines already are being drawn for the battle. Sen. Kefauver has revived the old idea of freeing the small producers. That is an offer of a little to save a lot. But it could attract support, particularly if linked to some of the FPC's recommendations. Many members might go for it if they found they couldn't get outright defeat of a bill to wipe out controls.

Big Business on Chopping Block . . .

THERE once was a king who had a favorite bed in his guest room. If his guest was too long for it, he chopped him down to size.

Rep. Ludwig Teller of New York must have read the fable. He has just about the same idea for a standard size for businesses.

Teller, now well along in his third month in Congress, has a bill to set up a National Commission for Free Economic Development. It would have the job of deciding when a company was too big for the bed he would build, and shave it down.

The agency with the long name would control any business having a combined capital, surplus and undivided profits of $10 million or more, or controlling more than 10 per cent of an industry. The first point alone would make a lot of oil companies wards of the Government.

The government board would have veto power over all mergers. It also would have the job of reducing the size of "unduly large" companies. It would apply tests set out in the bill to find whether a business was larger than required by "economic efficiency or technological necessity" or unduly restricted free and effective competition.

Nothing Startling from O'Mahoney . . .

SEN. O'MAHONEY'S probe of the European oil lift has led h'm to believe that our oil companies operating abroad influence our foreign policy.

These companies "have created the situation in which we now find ourselves" in the Middle East, O'Mahoney charged on the Senate floor. They have entered into agreements with foreign powers, which is a function of the U. S. Government. They have had a hand in framing our foreign policy.

O'Mahoney may be right on one point. If it wasn't for oil there might not have been a Middle East crisis. Dates and sand don't usually arouse international tensions.

On the other hand, it's only natural for a company doing business abroad to look to its government to protect its interests. It is usual, too, for a government to want to know how its nationals are being treated in other countries. And foreign policy is supposed to be aimed at protecting those interests. We—and the British, too—have been known to back our policy with warships.

Florida Line Gets New Nod

● But as FPC approves new gas rates, coal, railroad, and utility men huddle to discuss opening new markets to coal

WASHINGTON. — Natural gas and coal may be competing with each other in the fast-growing energy market of Florida.

Last week, as the proposed Texas-Florida natural-gas line slowly inched its way toward reality, coal men talked with Florida utility men about using coal in a big way for the first time in that area.

This came shortly after Houston Texas Gas & Oil Corp. and Coastal Transmission Corp. got approval from the Federal Power Commission on their new rate filings. Issuance of certificate for construction depends on these new rates.

Now, all that stands in the way of construction of the pipeline are some sideline conditions. Officials of the two companies say these conditions will be met promptly.

What's involved . . . Last December the companies were told that they could build the line if they met certain rate requirements. Revised tariffs were filed January 24. They were accepted February 21 and the companies were given 30 days in which to meet certain conditions not yet complied with.

The December order required Houston Gas to make each class of service bear its proper share of costs, based on a 6 per cent rate of return; eliminate the cancellation and reduction-intake provisions in transportation agreements with Florida Power & Light Co. and Florida Power Corp.; modify minimum bill provisions; and eliminate cancellation provisions in contracts covering direct primary interruptible service.

The company's new filing provides for an increase of 2 cents per 1,000 cu. ft., which will increase its revenues by $1,095,000 in the third year of operation. It did not cover all the conditions laid down, however.

Houston Gas still must change its transportation agreements so that the power companies may not cancel on the ground it is selling service at a lower rate to a third party or because transportation rates are lawfully changed. It also must eliminate sections containing automatic rate changes or references to other contracts. It will not, however, have to change its minimum bill provisions or wipe out cancellation clauses in its contracts for direct primary interruptible service.

The December order called on Coastal to provide separate charges on gas sold to Houston Gas and that transported for the power companies. It also was ordered to credit federal income tax accruals to its allowance for working capital; eliminate an escalation provision on gas from its own reserves, and modify or wipe out a provision giving credit to Houston Gas when Coastal removes heat content from gas which it purchases and transports.

These conditions have been met in part. The FPC's February 21 order, however, requires Coastal to revise its rate schedules to provide that after the first year of operation demand costs shall be in direct proportion to average deliveries during the greatest 3-day period of deliveries to Houston Gas during the preceding 12 months.

William R. Connole, one of two commissioners who opposed the project in December, went along with the unanimous FPC verdict. He said he now found the project both feasible and "required by the public convenience and necessity."

Coastal will gather and transport the gas to Baton Rouge. From there Houston will take it on to Florida, below Miami. The 2,600-mile, $150-million system is to be started this year. Some 250,000,000 cu. ft. daily is scheduled to start flowing to Florida in the summer of 1958, bringing the state its first large volumes of natural gas (see related story, page 180).

The Houston section of the line will be built by Midwestern Constructors, Inc., Tulsa, headed by F. E. Stanley who is also president and chairman of Houston. Midwestern will lay 702 miles of 24-in. from Baton Rouge, La., to Kissimmee, Fla. Harbert Construction Corp. has the contract for the 240-mile section of 18-in. from Kissimmee to Cutler, Fla., as well as 642 miles of 3 to 18-in. lateral lines in Florida. Construction is to start this spring.

Coal enters picture . . . Rising oil prices are spurring the coal industry to new efforts to compete with petroleum. And consumer resentment may help it get into markets closed to coal in the past.

The first step in the direction was taken here last week. Top officials of a half-dozen eastern railroads and five major coal companies met with Sen. Thruston Morton of Kentucky. Joined by high officers of three Florida utility companies, they talked plans to sell and use coal in what Morton described as the fastest growing energy market in the nation.

The idea was sparked by publication of a telegram sent President Eisenhower in January by McGregor Smith, chairman of the Florida Power & Light Co. Smith charged that the increase in oil prices could "wreck" Florida's economy. He suggested that government regulation of the oil industry might be in order.

Morton wired Smith he did not agree that government regulation was needed. Coal might be the answer to high oil prices, he said. And Smith replied that he would be interested in offers of coal for 74 of his plants if a long-term competitive price was named.

Freight rates . . . A big barrier to the use of coal in Florida has been the high freight rates. Railroad men at the hearing said more favorable charges might be worked out if enough coal tonnage could be had southward and cars could be used for phosphate shipments on the return haul.

Smith's company is one of two utilities which have signed up for a large share of the gas from the projected Texas-Florida pipeline. The use of coal would not affect those contracts, Smith said. The gas will supply only part of Florida's fuel needs, now estimated as equal to 12,000,000 tons annually and doubling every 5 years.

Morton said that studies of plants in three Florida cities will be started at once on the cost of conversion and other factors. Coal may be moving into the state within a year, he predicted.

Coming next week:

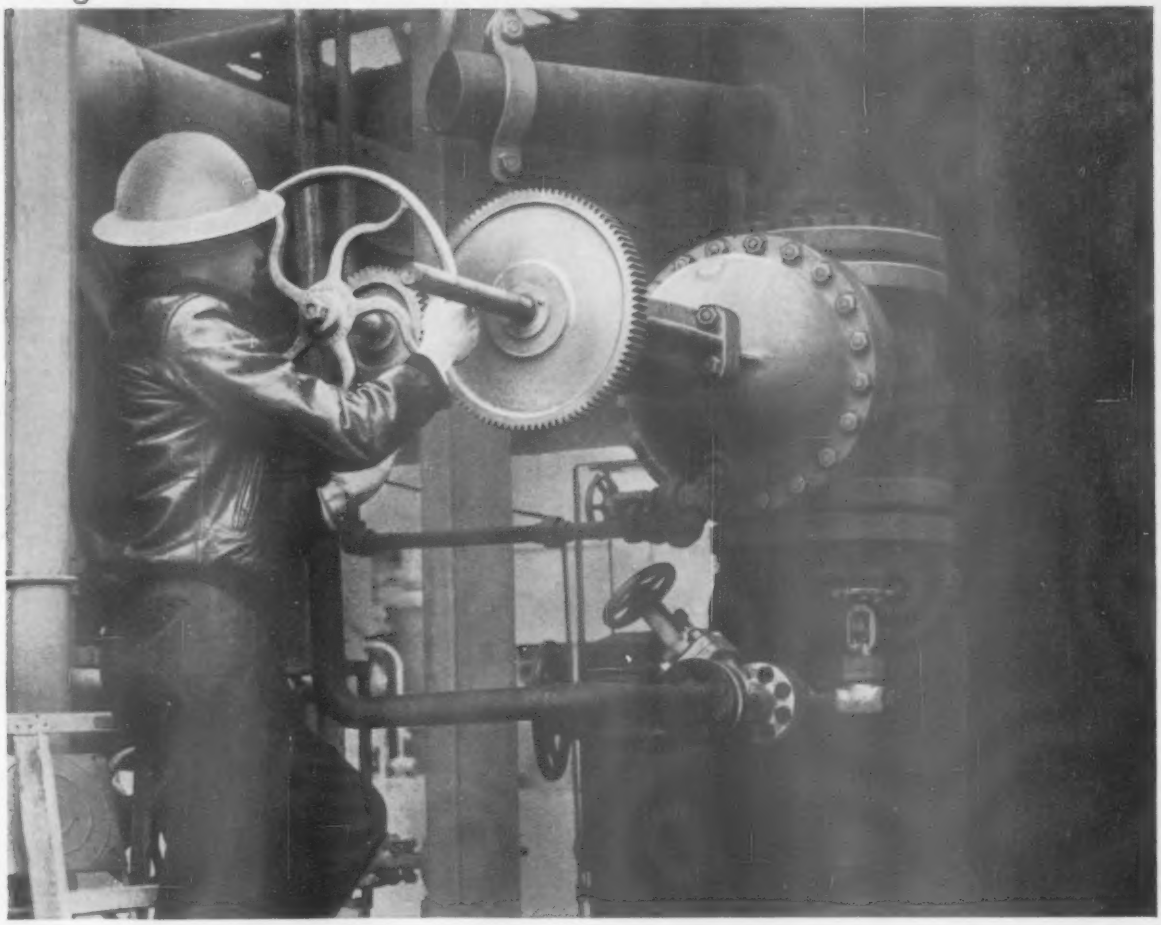
Natural gas and gas-pipeline issue

This special number will be filled with articles on natural gas and its transportation.

Here are examples: What Does It Cost to Find Gas?, Corrosion and Its Control, Taming Sour Gas, Centrifugal Compressor Performance, Series Supercharging Gas Engines, Pressure Testing Pipelines, Pictorial Pipeline Maintenance Records, Automation for Gas Pipelines, Charts for Open-Flow Potentials, Stable Compressor Foundations, PL Welding Tests.

Plus giant pipeline maps. Accompanying the issue will be one of the finest wall maps ever published by The Oil and Gas Journal. Size is 42 by 56 in. One side covers all major U. S. and Canadian natural-gas systems; the other shows products and crude-oil systems.

Single Crane Valve Gives Double Valve Protection



Look, man!—one valve and no blind gives positive isolation of any line

Phillips Petroleum Co. engineers wanted safe, efficient valve operation during regeneration cycling in the new unit at their Borger, Texas, refinery. They installed Crane steel gates modified with the Crane-designed flexible disc.

These valves safely isolate the regenerating gas from the gasoline vapors while desulphurization reactor chambers are regenerated. Gasoline vapors are processed at 90 psi and 700 deg. F. Steam and air for regeneration are at 15 psi and 900 deg. F.

Regardless of pressure differential, the Crane flexible disc provides a positive, leak-free seat at both upstream and downstream sides. No need of putting in blinds; no danger of forgetting them in the line.

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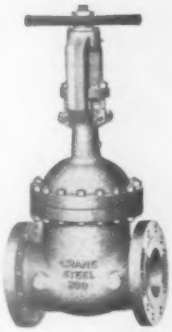

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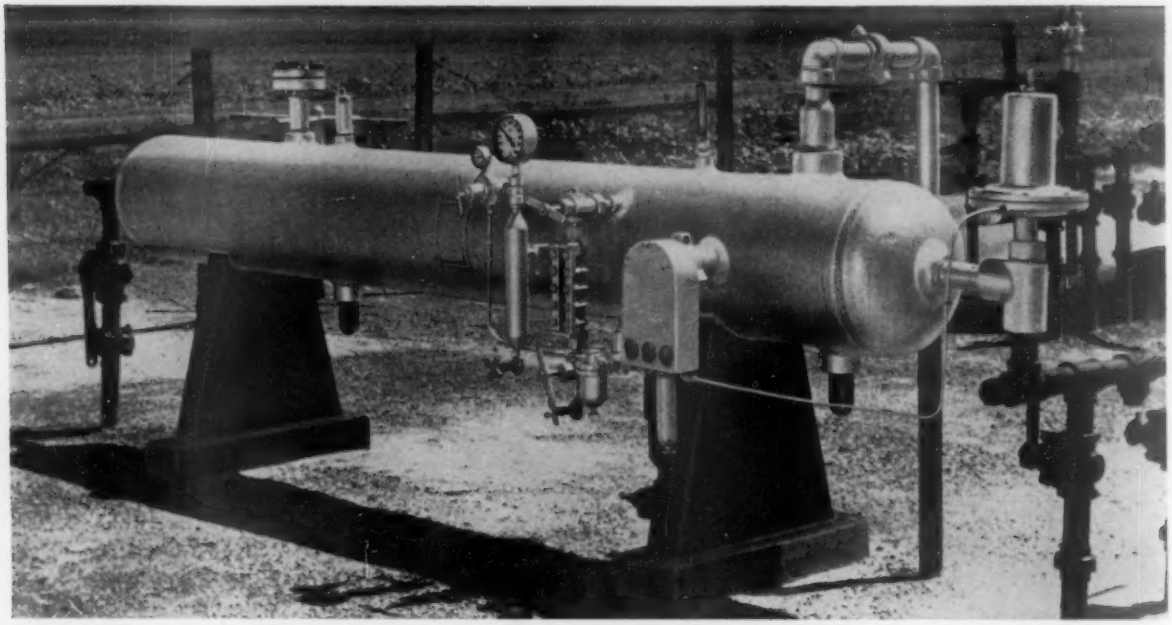

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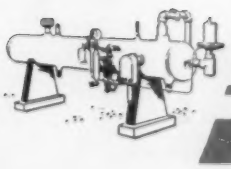

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Imports Up Slightly

● Resid makes up for big drop in crude shipments to U. S.; distillate liftings soar to an all-time high

THE tremendous change in the U. S. oil-movement pattern caused by the Suez crisis is shown graphically in the latest Census Bureau figures.

Crude imports, which dropped 13.6 per cent in November fell another 10.4 per cent in December. But the December drop was offset by increased receipts of residual fuel.

Crude imports from Canada averaged 159,900 bbl. daily in December to set a new all-time record.

Crude exports averaged 340,100 bbl. daily in December compared with 31,100 bbl. daily for the first 10 months of the year. Gasoline exports climbed to 134,600 bbl. daily in December, the highest level in years.

Exports of distillate fuels averaged 255,000 bbl. daily, breaking all previous records for commercial liftings of diesel fuels and light heating oils.

Total exports in December were more than three times the total for December 1955.

IMPORTS INTO CONTINENTAL U. S.
(Thousands of barrels)

	Dec. 1956	Nov. 1956	Dec. 1955
Crude—			
Mexico	509	508	524
Colombia	501	900	738
Venezuela	13,425	15,430	15,261
Peru			121
Kuwait	2,897	2,627	4,844
Saudi Arabia	739	984	2,367
Neutral Zone	498	396	150
Iraq	222	348	1,072
Iran	415		604
Qatar		411	559
Canada	4,957	4,137	2,410
Far East	1,319	1,770	1,161
Total crude	25,482	27,511	29,811
Daily average	822	917	961
Product—			
Residual fuel	17,482	13,314	17,565
Other products	961	1,503	1,550
Total products	18,443	14,817	19,115
Daily average	595	494	617
Total all oils	43,925	42,328	48,926
Daily average	1,417	1,411	1,578

EXPORTS*

Crude	10,544	8,332	1,040
Gasoline	4,172	2,570	2,336
Kerosine	659	562	92
Distillate	7,906	5,073	1,558
Residual	3,045	2,283	2,090
Lube oils	1,203	899	1,162
Other products	1,034	1,098	1,010
Total all oils	28,563	20,817	9,288
Daily average	921	694	300

*Excludes shipments to territories.

Processing briefs

Davison Chemical Co. has placed on stream its new $1.5-million reforming catalyst plant at Curtis Bay, near Baltimore. Output of the platinum on alumina catalyst began on a partial basis last summer. Plant capacity is double the original design because of rapidly rising demand for the catalyst by U. S. refiners.

Du Pont Co. has started converting its huge Belle, W. Va., synthetic ammonia plant from coal to natural gas as a raw material. Du Pont also is expanding capacity for making ammonia solutions and is stepping up research on development and use of new ammonia formulations.

Price of tetraethyl lead additives for motor and aviation gasolines has been increased by Du Pont Co. New price for motor mix is 37.92 cents per pound, up 0.92 of a cent. Motor Mix A is now 37.48 cents, up 0.9 cent per pound. Aviation mix is 41.58 cents per pound, up 1 cent.

The Farmers Union Central Exchange, Inc., is installing a Uniforming unit and Platformer at its 19,000-bbl. refinery at Laurel, Mont., under a $3 million improvement program. The Platfomer will handle up to 4,500 bbl. of gasoline a day and the Unifiner 7,000 bbl. of intermediate products. A new boiler and cooling tower also will be added. The project will be completed early in 1958.

Imperial Oil, Ltd., has cleared the first hurdle in the way of a planned $17-million expansion and modernization program at its 9,200-bbl. refinery at Calgary.

Calgary's City Terminal Planning Board approved Imperial's application. But the issue of rezoning the land for the project still must get approval from the city's Planning Advisory Commission which meets March 7. Residents of the area are protesting the move.

A new home-heating oil additive recently introduced by Esso Standard Oil Co. eliminates most of the old problems connected with condensation of water vapors. The additive is Paradyne HO-4.

Used in a maximum mixture of about 1 per cent by weight, it greatly reduces emulsification of oil and water and decreases the possibility of water reaching the combustion unit. The additive is ashless. It will replace detergent formerly used to prevent filter and nozzle plugging.

A construction program costing $4,200,000 is planned by Utah Oil Refining Co. Most of the money will be spent on improvements to the company's 29,000-bbl. refinery at Salt Lake City. Major item of the program is the construction of a carbon monoxide boiler.

Shell Oil Co. will include a $1,000,-000 waste heat boiler in the building program recently announced for its Los Angeles refinery. It will recover waste heat from catalytic cracking unit gases, as well as that obtained from complete combustion of carbon monoxide and other hydrocarbon gases. Steam generated in the 200,-000-lb. boiler will be used in the new 16,000-bbl. Platformer now under construction.

Western States Refining Co. has placed a 1,000-bbl. Houdriformer on stream at its North Salt Lake City refinery. Built as a part of a $1,000,-000 modernization program, the new unit produced 97.0 F-1 octane leaded reformate within 2 days after startup.

Also for Refiners . . .

Domestic refiners are using more and more Canadian and Venezuelan crudes, latest figures on imports reveal. That will provide one of headaches when federal officials start studying imports problem when Suez reopens (P. 58) . . . Independent producers appearing before O'Mahoney committee launch attack on companies who import foreign crude for their refineries (P. 60) . . . Gulf Oil has entered the third-grade field. It's new superpremium will make bow soon (P. 64) . . . Battle for Florida's energy market won't be between fuel oil and gas alone. Coal now is trying to edge into picture (P. 70) . . . Tidewater has put its giant cat-poly unit on stream at Delaware City refinery (P. 75).

PLUS THESE TECHNICAL FEATURES: Refinery Construction Index (P. 93) . . . A.P.I. report shows corrosion costing refiners $300 million per year (P. 108) . . . The Foreman's Page (P. 119) . . . Questions on Technology (P. 121) . . . PETROdatics (P. 122) . . . and Refiner's Notebook (P. 125).

Conservation Boosted

Colorado Commission sets April 15 deadline for Rangely field unitization, approves water flood at Adena field

DENVER.—The Colorado Oil and Gas Conservation Commission has taken two steps to nearly double ultimate oil recovery from the state's two largest fields—Rangely and Adena.

In separate actions, the commission:

. . . Ordered Rangely operators to complete unitization of the northwestern Colorado field by April 15.

. . . Approved plans for water injection of the J-sand formation in Adena field.

Warwick M. Downing, commission chairman, said conservation practices planned for Rangely could increase ultimate production from 340,000,000 to 650,000,000 bbl.

The secondary-recovery program, Downing said, would boost ultimate production capacity of Adena from 41,000,000 to an estimated 71,000,000 bbl. Adena is located south of Fort Morgan in Morgan County.

Rangely field . . . The California Co. will be operator of the unit at Rangely field, the state's largest. Other major operators in the field are The Texas Co., Union Pacific Railroad, Pan American Petroleum Corp., Sharples Oil Co., and Phillips Petroleum Co.

Downing said Calco's share of the profits will be slightly more than 50 per cent. Pan American and a joint U.P.-Texaco interest each will receive about 19 per cent, Phillips about 9 per cent, and Sharples about 3 per cent.

The participation formula has been approved by more than 100 separate royalty owners and principal partners of the six big companies in Rangely. Approval was also obtained from the U. S. Government since fee and federal acreage overlie the producing Weber reservoir. No state acreage is included in Rangely.

The commission has been attempting to unitize Rangely for 10 years, but operators have been unable to agree on a participation formula until recently. The commission recently warned that failure to unitize would result in more stringent orders to curb the flaring of natural gas produced with oil.

The 480-well field has been operating since last July 17 under an order limiting oil production to 300 bbl. daily from any well and requiring reinjection of accompanying gas in excess of 180,000 cu. ft. daily. Daily oil production has been averaging 74,000 bbl.

Rangely's major operators have spent $7,500,000 on new equipment to carry out reinjection practices. Calco is operating 18 compressors, Pan American 5, and Texaco several others.

Texaco has been conducting a pilot project to study possibility of storing gas in the Entrada formation. Initial results have been termed encouraging.

Phillips is conducting preliminary surveys in connection with a possible water-flood project in Rangely.

Adena field . . . Adena was unitized last October with Pure Oil Co. as operator for the 90 firms and individuals holding interests in the Denver-Julesburg basin field.

Production has been limited to an average of 14,000 to 16,000 bbl. of oil daily. There are 117 producers out of a total of 181 wells in the field. Wells on 15 leases are shut in.

Adrian Pitzer, head of Pure Oil's production department at Fort Morgan, said the water pressure-maintenance program will increase Adena production by 6,000 bbl. daily.

"This is a gradual process which may take a year to complete," Pitzer said. "Lines must be laid and the pressure rebuilt. We have been taking oil out for 3 years and it is going to take time to build up the program before we can increase production. New wells will be drilled in the blank spaces in order to balance out the area."

Somebody goofed:

Permit Had C.A.T.C. Planning a Whopper

HOUSTON. — Officials of C.A.T.C. Offshore Group are sheepishly denying reports that they plan to drill the world's deepest well off the coast of Louisiana.

Published accounts, apparently based on a state drilling permit, said the well would be drilled to 23,500 ft. Continental Oil Co., operator for C.A.T.C., attributed the reports to a "clerical error." Proposed depth should have been listed as 13,500 ft.

The highly publicized test will be drilled from a platform in 112-ft. water in Grand Isle Block 43. It will be bottomed about 5,000 ft. east in West Delta Block 69.

Alberta Crude Dips

March requests 25,331 bbl. below February production

CALGARY.—Another decrease in Alberta's oil production is forecast in the March nominations which total 404,075 bbl. daily. Allowable production for February was 429,406 bbl. daily.

United States refiners requested 91,925 bbl. daily, with Shell Oil Co.'s 50,000-bbl. Anacortes, Wash., refinery leading the way. Shell asked for 40,000 bbl. daily. General Petroleum Corp. was second with a request of 34,470 bbl. daily for its 37,000-bbl. plant at Ferndale, Wash.

Imperial Oil, Ltd., was again first among all bidders with its nomination for 101,825 bbl. daily. Imperial classified 22,800 bbl. as working stocks for export. This amount will probably find its way into the Trans Mountain pipeline system.

British American Oil Co., Ltd., wants 43,700 bbl.; Canadian Oil Companies, 23,000; Standard Oil Co. of California, 13,725; McColl-Frontenac, 12,000; and Consumers' Cooperative Refinery, 10,600.

Of the total, 170,550 bbl. daily are scheduled for delivery east through the Interprovincial pipeline and 154,895 bbl. will go west through the Trans Mountain line.

Other U. S. refinery nominations were International Refineries, Wrenshall, Minn., 11,300 bbl.; Bay Refining Corp., Bay City, Mich., 4,500; Dow Chemical Co., Midland, Mich., 1,000; West Branch Refineries, West Branch, Mich., 300; Union Oil Co. of California, Cut Bank, Mont., 255; and Phillips Petroleum Co., Great Falls, Mont., 100.

Tax Decision Delayed

DENVER.—The California Co. will have to wait until mid-summer to find out whether a District Court agrees with its contention that Colorado's gross income tax on oil and gas production is unconstitutional.

Judge Edward J. Keating took Calco's case under advisement last week after 2 weeks of testimony. He scheduled final arguments for June 20 and promised a decision by July 25. The company is attempting to recover more than $1,000,000 in such taxes already paid.

Calco's chief contention is that oil produced in the state enters interstate commerce from the time an oil reservoir is tapped and the state has no right to levy a tax. The state claims

it has authority to tax natural resources taken from land within the state.

Regardless of the suit's outcome, the case will be appealed to the Colorado Supreme Court. Indirectly involved in the litigation is more than $10,000,000 paid to the state by oil firms—much of it under protest—since the tax was enacted in 1953.

Tests Hit In Texas

Two strikes get big flow, one prolific in dual zones

HOUSTON.—Large flows of oil and gas were reported in two deep discovery wells tested last week in the Alta Loma area, 25 miles southeast of here in western Galveston County.

The wells, only 1 mile apart, were drilled by Hassie Hunt, Trustee, of Dallas, joint owner with Phillips Petroleum Co. They are about 5 miles east of the prolific Chocolate Bayou field in Brazoria County where Phillips is the major operator.

One of the discovery wells, the 1 Sayko, is a prolific producer from two zones and a potential producer from at least three others which have not been tested.

The shallower of the two tested zones has 30 ft. of Frio sand at 11,285 ft. It flowed at the rate of more than 600 bbl. of clean oil daily through small chokes. The lower zone, with 15 ft. of Frio sand at 11,488 ft., flowed 110 bbl. of condensate with 2,600,000 cu. ft. of gas per day, also through small chokes.

A total of 34 ft. of good gas-condensate sand was logged in three untested zones.

Phillips has 50 per cent interest in this well with leases on 2,000 net acres around it.

The other well, 1 Sass, tested large amounts of condensate-rich high-pressure gas from the lower part of a 56-ft. section of Frio sand at 11,149 ft. No gage of flow was reported. Phillips owns 58 per cent interest in this well and has 1,950 net acres of leases around it.

Gulf Appeals Allowable Suit

OKLAHOMA CITY. — Gulf Oil Corp. will appeal to the U. S. Supreme Court its suit contesting an order of the Oklahoma Corporation Commission. It served notice of appeal in U. S. District Court here last week.

Gulf is seeking an injunction against an order of last summer forcing all oil firms to purchase the full allowable of any Oklahoma wells in which they held interest. Gulf contended this forced it to buy 5,000 bbl. daily more than its market demand.

East Coast Crude Line Pushed

AMARILLO, Tex.—E. O. Thompson, veteran member of the Texas Railroad Commission, has prodded Congress to encourage the building of a big-inch crude line from Texas to the East Coast.

Thompson disclosed this in a speech last week before the Panhandle chapter of the Texas Society of Professional Engineers.

He said he advocated immediate construction of such a line last month while appearing before the interstate and foreign commerce committee of the House of Representatives.

Thompson said he was invited to appear before the committee "to discuss some of the problems that have come up with the closing of the Suez Canal."

He said he told the committee the need was great now for a line from Texas to the Philadelphia refining area so that in event of war, the country wouldn't have to build it after the war started.

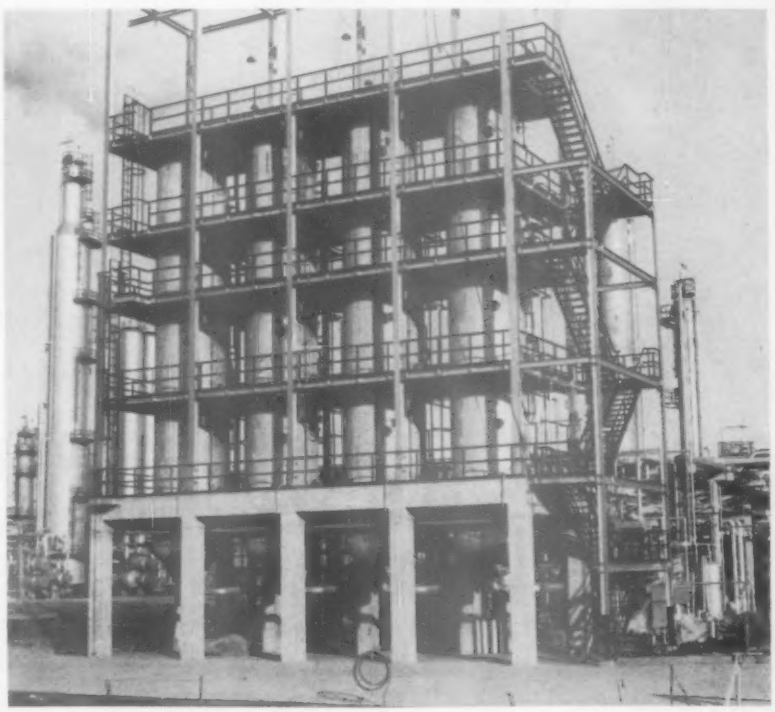
Tankers undependable . . . "Reliable information," he said, "is that Russia has constructed more than 400 new submarines aimed at the destruction and sinking of oil tankers with the view of immobilizing our Army, Navy, and Air Force.

"You will remember we had to build the Big and Little Big Inch both from Texas to the East Coast after World War II started because of ever-mounting sinkings by German subs — even right off the coast of Florida in plain sight of people on land. The pipelines did the job."

Thompson told the committee he thought the inquiry it was making was timely and would be worth all the effort "if a line to the East Coast comes out of it."

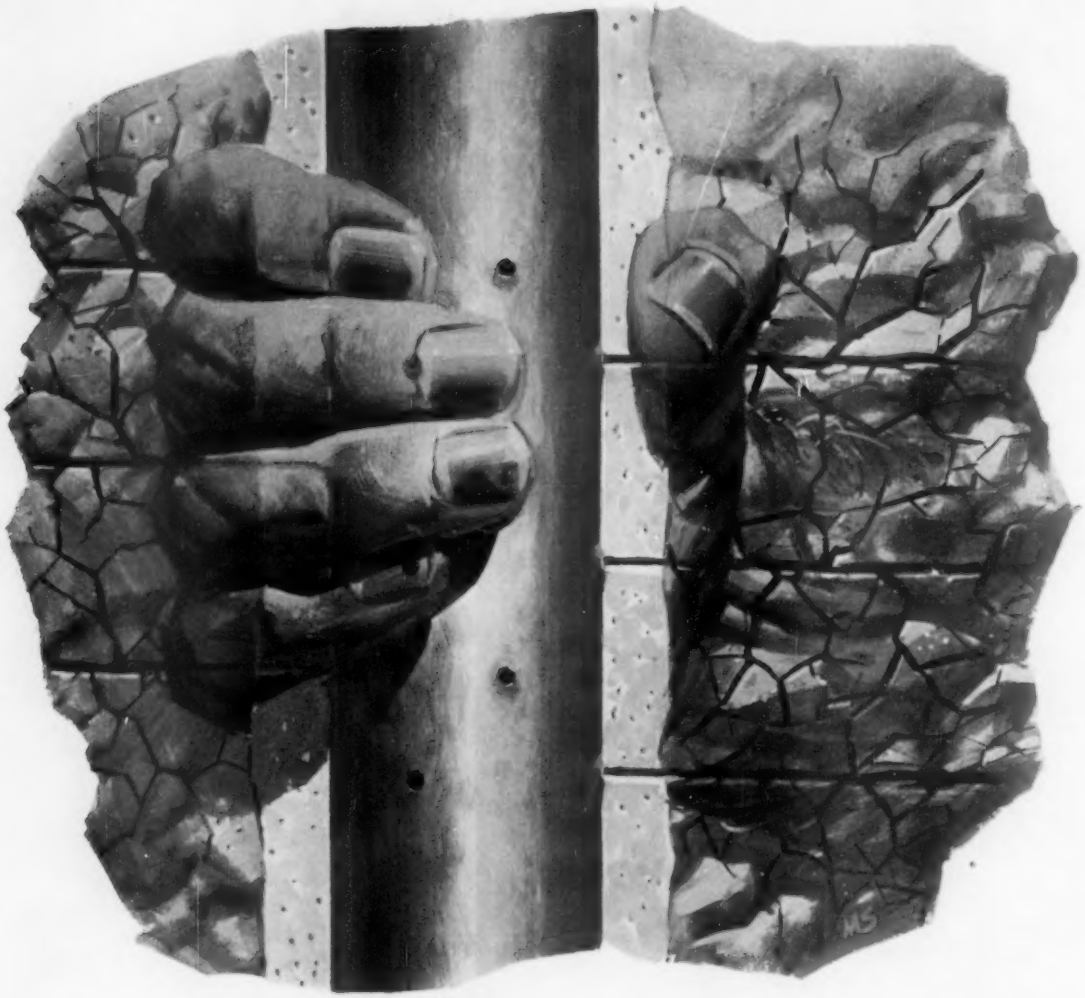
"We can find the oil. But we must have adequate pipelines to move it cheaply and safely. Without gasoline and lubricating oil even the atomic bomb could not be delivered."

He told the committee, "A new pipeline to the West Coast has been announced already."



Largest Cat-Poly Unit in U. S.: Tidewater Oil Co. has put this giant catalytic polymerization unit on stream at its new Delaware City refinery. It can handle 15,800 bbl. per day in light hydrocarbon feed stock from the catalytic cracking and fluid coking operations. Finished polymer gasoline capacity ranges from 5,000 to 6,000 bbl. daily.

THE WEATHERFORD TECHNIQUE



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FBI Aids Oil Probe

Grand jury's broad inquiry may last for 4-6 months

ALEXANDRIA, Va.—The Government's latest attack on the oil industry gets under way here this week before a federal grand jury.

The broad scope of the inquiry became apparent last week as federal officials prepared for the grand jury inquiry into oil pricing and other policies. These were the straws in the wind:

. . . FBI agents were known to be questioning oil officials privately.

. . . Witnesses are being called from many scattered areas over a large section of the country.

. . . Officials and employes of major oil, pipeline, and allied companies have been subpenaed by the Justice Department.

The Justice Department has mapped an almost unlimited field for the inquiry. This was shown by the motion filed with U. S. District Judge Albert V. Bryan. It is expected to last for 4 to 6 months.

Purpose of the grand jury, the motion said, would be to investigate "alleged violations of federal antitrust laws and including the Sherman Act and the Clayton Act, and other federal acts, by certain companies, firms, corporations, persons, associations, members of associations, and others who are now engaged in, or have engaged in, the production, storage processing, distribution, purchasing, and selling of petroleum and petroleum products."

"Fair Field" Price Outlawed

LITTLE ROCK.—The Arkansas Supreme Court has rejected the "fair field" method of pricing natural gas produced by a transmission company. Instead it ordered prices designed to give a 6.43 per cent over-all return.

The court overturned a 1955 decision of the Arkansas Public Service Commission that Arkansas Louisiana Gas Co. could base its charges to industrial customers on "fair field" theory. The commission also had allowed a return of 8 per cent for the company on industrial-gas sales.

Arkansas Louisiana produces about 20 per cent of the gas it sells. Under the fair field price, the company was allowed the same price for the gas it produces as the price it paid independent producers for gas.

President J. C. Hamilton of Arkansas Louisiana said the decision will force his company to curtail if not abandon production of its own gas supplies.

Pipeline briefs

Cities Service Oil Co. is building a 29.6-mile low-pressure gas-gathering system in Roberts Ranch field to serve a gasoline plant in Midland County, Texas. Vaughan & Taylor Construction Co., Odessa, will complete the 4 to 24-in. system this month.

Cities Service Pipe Line Co. plans a 29-mile, 6-in. ethylene line from Cities Service Refining Co.'s Lake Charles, La., refinery to Orange, Tex. The line, to be finished by July 31, will serve a Du Pont Co. petrochemical plant.

Magnolia Pipe Line Co. has made two recent additions to its West Texas crude system. A 29-mile, 8-in. line was laid from Seminole to Andrews by McVean & Barlow, Inc. H. B. Zachry Co. built 36 miles of 12-in. from Andrews to Midland. O. R. Burden Construction Corp. is relocating 8 miles of 20-in. crude line around Maumelle Lake, Arkansas. This job will be completed by March 15, as will a 6,000-ft., 16-in. line being built by Brown & Root, Inc., in Lake Whitney reservoir in Texas.

Brown & Root, Inc., has several projects under way on the Gulf Coast. It is laying several miles—the exact number not determined—of 3 and 4-in. crude line for Shell Oil Co. in South Louisiana. The job is to be finished next September.

A 48-mile, 20-in. gas line is being laid from Grand Chenier to Lake Charles, La., for United Gas Pipe Line Co., to be in the ground by March 15. A Houston Ship Channel crossing was made last week for Texas Eastern Transmission Corp.

Brown & Root also finished laying 22 miles of 4, 6, and 10-in. crude lines in the Gulf of Mexico for Humble Oil & Refining Co.

Pacific Gas & Electric Co. will build a 14-mile, 12-in. gas line from Santa Cruz to Davenport, Calif. The $780,000 project will serve the Pacific Cement & Aggregates, Inc., plant at Davenport.

Arapahoe Pipe Line Co. completed its Colby, Kans., booster station last week. The 800-hp., electric-driven centrifugal pumping unit will raise capacity on the 18-in. crude line from Merino, Colo., to the Schurr station in Kansas by 8 per cent. Capacity of this line will be 100,000 bbl. per day. Arapahoe also is adding a 400-hp. electric-driven unit to its Gurley station by July 1. This unit is planned for standby use only.

Arkansas Louisiana Gas Co. has started studies for a 300-mile, big-inch gas line to make new Gulf Coast reserves available to its system. The project would cost some $30 million. The company said it would have to pay a wellhead price higher than current retail rates to many of its customers. Arkansas Louisiana, whose reserves have been declining, also budgeted $5 million for a stepped-up exploration program this year.

Mississippi River Fuel Corp. plans to loop 125 miles of its dual 22-in. gas system from East Texas and Louisiana to St. Louis to increase capacity 50,000,000 cu. ft. daily. The $12-million project will be laid before the Federal Power Commission soon.

Also for Pipeliners . . .

Texas' first lease automatic custody transfer units have proved a big success. Railroad commission has extended their trial period and approved several other projects (P. 61) . . . Showdown nears in Texas in battle between producers and common-carrier oil trunk lines. Railroad Commission has ordered sweeping hearing starting April 1 into controversy over unconnected wells (P. 62) . . . The Texas-to-Florida gas line practically has the approval of FPC. New minor conditions will be met promptly. At same time coal is making a bid for a share of the expanding energy market now being split between fuel oil and gas (P. 70) . . . A big-inch crude line from Texas to the Philadelphia refining area is being boosted again. Texas Railroad Commissioner E. O. Thompson set it off during a recent Washington visit (P. 75) . . . "Fair field" price method has been outlawed by the Arkansas Supreme Court (P. 77) . . . Work is picking up steam on the first big-inch gas line bringing Mexican natural gas to the U. S. (P. 79) . . . Sinclair already has pipe on the ground to build an 8-in. crude line linking a promising new Eastern Venezuelan field to a trunk line (P. 82).

PLUS THESE TECHNICAL FEATURES: Humble Pipe Line finds automatic custody transfer at the lease more accurate than hand gaging (P. 94) . . . and Pipeline Patrol's construction report (P. 133).

JOHN P. HAMMOND
... New president of new society.

BASIL P. KANTZER
... Scheduled to take over in 1958.

A.I.M.E. Forms New Oil Group

NEW ORLEANS. — The petroleum engineer took another step up the prestige ladder last week.

The 87-year-old American Institute of Mining, Metallurgical, and Petroleum Engineers set up a new society composed solely of members of the oil industry.

It will be known as the Society of Petroleum Engineers of A.I.M.E. As such, it succeeds the petroleum branch of the parent organization.

In doing so, the A.I.M.E. board of directors yielded to popular demand and decided not to toss more initials into the alphabet soup of its unwieldly name. The change was announced at the group's annual meeting.

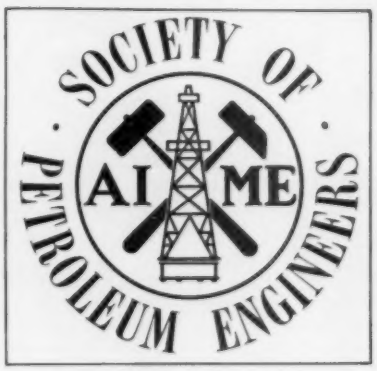
First president of the new society is John P. Hammond, assistant general superintendent of Amerada Petroleum Corp., Tulsa.

Nominated for 1958 president is Basil P. Kantzer, Houston, manager of operations of the gulf division of Union Oil Co. of California.

John S. Bell, California area manager for Humble Oil & Refining Co., Los Angeles, and E. N. Van Duzee, Midland, Tex., area production manager for Shell Oil Co., were nominated for 1958 vice presidents.

Fast-growing segment . . . The board also gave new names to the other branches of the institute: Society of Mining Engineers of A.I.M.E., and Metallurgical Society of A.I.M.E.

But the move does very little to increase the prestige of these branches. The "M" in A.I.M.E. has always given equal recognition to both.



NEW INSIGNIA for oil engineers.

As the fast-growing segment—11,000 members — petroleum engineers make up about 35 per cent of the total membership. As recently as 1946, the total was only 16 per cent.

In view of their growing importance as a part of the organization, petroleum engineers felt they were being treated like step-children.

However, this feeling was assuaged somewhat last year when the word "petroleum" was added to the institute's official name.

But the alphabetical symbol—already one M short—couldn't gracefully take the extra initial involved in the longer name. To the layman, at least, the petroleum engineer still had lesser stature than his fellow A.I.M.E. member.

"This action (by the directors) signalizes a maturity which the petroleum engineering field has fully achieved," said Hammond.

Industry briefs

A united labor front in contract negotiations with California's major oil companies was the object of a meeting at Bakersfield, Calif., last week. The meeting was attended by representatives of six oil-workers unions. This is the third such meeting. A fourth is planned soon. The unions want a 10 per cent wage boost or a minimum of 25 cents an hour more.

The Nebraska Supreme Court has held the city of Kimball has an interest in oil and gas produced from beneath streets and alleys. The court reversed a District Court decision that the city had no such valid claim. The Supreme Court held the city has a share in production "until such time as said streets and alleys may be vacated."

U. S. Smelting, Refining & Mining Co. will close its Billings, Mont., oil exploration office next September. The firm's Denver office will be enlarged to supervise land and geological operations from northern New Mexico to Canada. The remainder of the work formerly done by the Billings office will be handled by the Calgary office.

Crude-oil production in Saskatchewan reached an all-time record of 82,833 bbl. daily during November. The province had 2,316 producers registered during the month. Steelman field production was tops for the month with 310,393 bbl. from 177 wells.

Sun Oil Co. plans to build three new supertankers. Contract has been let to the company's wholly owned subsidiary, Sun Shipbuilding & Drydock Co., for three 47,500-dwt. vessels. Sun recently was granted a certificate of necessity permitting quick tax writeoff on 60 per cent of the total cost of $45 million.

Carter Oil Co. has increased its 1957 capital-expenditures budget to $56 million, a 16 per cent increase over last year. The outlay is the largest in the 64-year history of the company. The money will go for a stepped-up exploration program and for expanding refining and marketing facilities. Carter operates in 25 states.

Future of the Government's oil-shale plant at Rifle, Colo., is again up in the air.

The House appropriations committee has turned down Interior's request for $210,000 to keep the plant in standby. It indicated the money should be asked

by the Navy, to which the plant was transferred last year. The Navy wants to resume the research dropped by Interior, and may now come up with some program to justify retention of the plant.

The Interior Department will open 44,000 acres of land near Fairbanks, Alaska, for mineral leasing June 22.

The land was withdrawn in 1952 for use by the Air Force. Apparently not all of it is potential oil land since it is being opened to settlement as well as development.

Louisiana's March oil production allowable remained unchanged from February except for a small increase to allow for new production. The addition of 8,189 bbl. does, however, raise the state's allowable to a record high of 990,642 bbl.

March allowables by districts are: Houma, 239,301 bbl.; Lafayette, 196,929; Lake Charles, 86,370; New Orleans, 320,480; Monroe, 75,607; and Shreveport, 71,955.

Applications for government mortgage insurance on 9 new tankers are under study in the Maritime Administration.

The Maritime Administration can insure loans on 87½ per cent of the cost of ships of 3,500 gross tons and over with speeds of 14 knots or better.

The $7,250,000 "wildcat" lease off the coast of Summerland, Calif., is in for some deep core drilling. Standard Oil Co. of California and Humble Oil & Refining Co. have moved in a big seagoing drilling barge. The expensive 5,500-acre lease was awarded in January—the first such "wildcat" lease let under the Cunningham-Shell Act of 1955. If tests are favorable, a platform for exploratory drilling will be set up at the site about 1½ miles offshore. The mobile unit is owned by Offshore Contractors, Inc. With a steel hull weighing 4,000 tons, it has eight supporting elements 195 ft. high.

The Independent Petroleum Producers and Royalty Owners Association of New Mexico will be organized here March 6. The group has outlined a fight against imports as its first major objective.

Groundwork for the association was laid at an earlier meeting when temporary officers were elected. They were B. M. Keohane, Roswell independent, chairman; Charles C. Loveless, secretary-treasurer; and Jack M. Campbell, Roswell attorney, general counsel.

WINTER PIPELINING in Rio Grande Valley is a shirt-sleeve operation. It means . . .

Mexican Gas to Flow By Fall

McALLEN, Tex. — Construction is picking up momentum on the first big-inch pipeline to bring Mexican natural gas into the United States.

This is Texas Eastern Transmission Corp.'s 395-mile, 30-in. trunk from the Mexican border near Reynosa to a connection with the company's present system at Vidor near Beaumont.

Three spreads have been at work on the main line since early December and now have laid over 200 miles. Other spreads will be joining them soon.

An H. C. Price Co. spread, working a 71-mile middle section of the line, was scheduled to complete its chunk by the end of February.

H. B. Zachry Co. should finish off a 67-mile segment extending north from Reynosa soon after. Zachry has contracts for two more spreads totaling about 135 miles. Clearing and grading work is under way on these.

Houston Contracting Co., which will lay the remaining two spreads totaling 121 miles, will start laying pipe this week on a 50-mile section from near Angleton east to the Houston Ship Channel. The company will start next week on 50 miles from Fannett west to the ship channel, and the following week on 21 miles from Fannett east to the Vidor station.

Lateral completed . . . One important portion of the construction project already has been completed.

Grayco Construction Co. has finished work on a 45-mile, 24-in. tie-over line between the new 30-in. and Texas Eastern's 30-in. main which taps the Wilcox Trend gas-producing area.

Rivers tackled . . . Work on all but 4 of the 12 river and bay crossings involved is under way. Pentzien, Inc., has completed crossings of the Brazos and Trinity rivers and Cedar Bayou. Pentzien is also the contractor on crossings of the Colorado and San Bernard rivers.

Western Pipe Line Co. is well along on all three of its projects, crossings of the Nueces River and bay and the Lavaca and Carancahua bays. Missouri Valley Dredging Co. has started on crossings at Hynes and Guadalupe bays. Brown & Root, Inc., has completed crossings of the Houston Ship Channel and Zachry is preparing to tackle the Rio Grande.

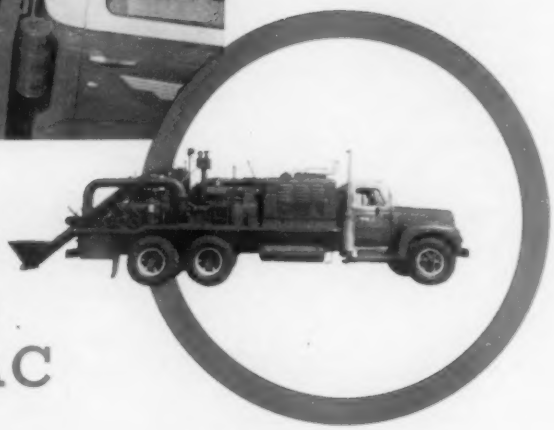
Compression work stalled . . . Currently, no compressor facilities are being built on the Reynosa-Vidor line since capacity is sufficient to carry the initial contract load of 115,000,000 cu. ft. daily without compression.

More horsepower and loop lines will be built, however, on the company's existing system from Vidor to the East to handle the new load.

Texas Eastern is adding 77 miles of 30-in. looping and 32,250 hp. in compressors along the older line. This pumps up cost of the entire project to about $82,700,000.

Work on the loops and most of the stations is being held up until spring, but construction is well along on two of the new stations and at all but two of those where compression is being added.

The entire program should be completed and Mexican gas flowing through the system by late summer or early fall.



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251 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

Production Drop Halted

● **Free-World output in December makes up nearly half of loss due to Suez; every major oil region records gains**

THE free-world oil industry almost cut crude production losses in half in December.

Output for the second month after the Suez closure rose 660,200 bbl. daily to 14,358,400 bbl. daily. This was 5.6 per cent less than the "normal" output of 15,217,800 bbl. during October, the last month before the canal and Iraq-Mediterranean pipelines were closed. Production dropped 10.1 per cent in November.

All major producing areas had gains. Here's the over-all picture:

...The Middle East still was severely crippled. But a rise of 186,200 bbl. daily to 2,429,000 bbl. daily shaved the loss since October to 37.4 per cent from 44.7 per cent.

...U. S. output averaged a record 7,377,000 bbl. daily, a gain of 238,000 bbl. daily. Compared with October, the increase was 411,000 bbl. daily, or 5.9 per cent.

...Venezuelan production gained another 98,300 bbl. daily to reach 2,721,000 bbl. daily, its seventh straight record. This level was 185,600 bbl. daily, or 7.6 per cent higher than October.

Ghawar hits a billion . . . Saudi Arabia's decline of 29,500 bbl. daily made it one of the two major Middle East producers to show a decrease. This brought the kingdom's yearly average to 986,100 bbl. daily, still a gain of 2.2 per cent over 1955.

Crude-Oil Production Around the World

(Daily average in thousands of barrels)

	Dec. 1956	Nov. 1956	Dec. 1955
Western Hemisphere:			
Argentina	80.7	80.7	86.3
Bolivia	9.2	9.1	7.5
Brazil	25.0	18.3	6.8
Canada	540.0	515.1	404.8
Chile	10.6	10.6	7.8
Colombia	122.1	122.1	117.1
Cuba	1.1	1.2	1.5
Ecuador	9.7	9.7	10.1
Mexico	250.0	247.5	242.2
Peru	53.7	53.7	47.8
Trinidad	84.0	84.5	72.6
Venezuela	2,721.6	2,623.3	2,291.8
Total	3,907.7	3,775.8	3,296.3
W. Europe & Africa:			
Algeria	0.4	0.4	1.0
French Morocco	1.8	1.8	2.0
Egypt	0	2.0	35.6
Austria	64.6	65.4	65.4
France	29.3	28.6	22.2
W. Germany	71.3	70.2	64.4
Italy	18.2	16.5	6.9
Netherlands	24.6	23.1	19.3
Turkey	6.5	6.5	4.2
United Kingdom	1.2	1.2	1.2
Yugoslavia	6.4	6.3	5.1
Toal	224.3	220.0	227.3
Middle East:			
Bahrain	30.1	30.1	30.1
Iran*	524.0	531.0	344.0
Iraq†	220.9	189.0	741.1
Israel	1.2	1.0	0.3
Kuwait	820.0	557.9	1,028.0
Neutral Zone	25.0	25.0	23.6
Qatar	117.5	89.0	114.8
Saudi Arabia	690.3	719.8	1,028.2
Total	2,429.0	2,142.8	3,310.1
Other Asia:			
British Borneo	118.0	118.0	114.7
Burma	4.5	4.5	5.2
India	9.2	9.2	7.0
Indonesia	270.0	270.0	232.0
Japan	5.7	5.9	6.2
New Guinea	7.1	7.3	7.6
Pakistan	5.7	5.7	5.7
Total	420.4	420.6	378.4
Total Free World:			
Foreign	6,981.4	6,559.2	7,212.1
United States	7,377.0	7,139.0	7,155.0
Total Free World	14,358.4	13,698.2	14,367.1
Communist Countries in Soviet Orbit			
Romania	200.0	200.0	150.0
Russia	1,600.0	1,600.0	1,400.0
Others	50.0	50.0	50.0
Total	1,850.0	1,850.0	1,600.0
World total	16,208.4	15,548.2	15,967.1

*Includes estimated 4,000 bbl. daily from Naft-i-Shah field not operated by consortium companies.

†Includes estimated 5,000 bbl. daily in 1956 and 12,000 bbl. daily in 1955 from Naft Khaneh field, operated by British Petroleum Co. rather than I.P.C.

Figures are from reliable industry reports or official government sources. Data for Communist countries in the Soviet orbit, which includes the European satellites and Red China, are based on competent estimates. Authentic information is not available on month-to-month production in these areas. Estimates also were made for those countries, particularly in Southwest Asia, where complete current reports are lacking.

TREND OVER LAST YEAR

	Western Hemisphere less U.S.	Middle East	Total non-Communist countries
1955—			
December	3,296.3	3,310.1	7,212.1
1956—			
January	3,363.7	3,392.6	7,368.5
February	3,426.2	3,415.7	7,453.4
March	3,471.2	3,624.3	7,713.8
April	3,320.5	3,736.6	7,690.8
May	3,356.5	3,793.9	7,788.1
June	3,519.1	3,713.7	7,871.7
July	3,549.8	3,806.1	7,996.6
August	3,618.2	3,685.8	7,965.6
September	3,637.2	3,721.8	8,019.3
October	3,688.3	3,873.5	8,251.8
November	3,775.8	2,142.8	6,559.2
December	3,907.7	2,429.0	6,981.4

The country's biggest field, Ghawar, produced its billionth barrel on Christmas Day. It was discovered at Ain Dar in 1948, and went on production January 3, 1951.

The field got its present name after 'Uthmaniyah, 46 miles south of Ain Dar, and 1 Shedgum, 9 miles east, turned out to be part of one big field. Haradh later proved to be another extension.

Greater Ghawar now is 130 miles long and 12½ miles wide. Normally, output averages about 670,000 bbl. daily from 74 wells flowing from 7,125 ft.

An older Saudi field, Abqaiq, produced its billionth barrel of crude in September 1954.

Trans-Arabian Pipe Line Co., which has the only line open to the Mediterranean coast, increased deliveries to 347,300 bbl. daily during the month. Tapline's deliveries from its Sidon, Lebanon, terminal averaged 330,700 bbl. daily for the year. In 1955 they were 319,200 bbl. daily.

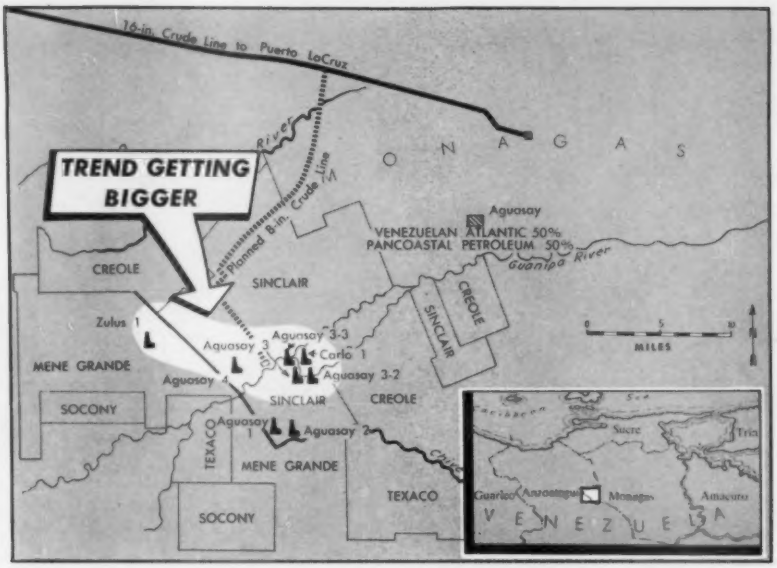
Top comeback . . . Kuwait made the best comeback.

Output rose 262,100 bbl. daily to 820,000. The shaikdom's yearly average was 1,092,000 bbl. daily, within a few hundred barrels daily of its record 1955 production.

Iraqi production rose 31,900 bbl. daily to 220,900 bbl. daily. The hardest hit of any major country, its 1956 average was 638,700 bbl. daily, down 49,500 bbl. daily from the previous year.

Qatar's high gravity, specialty crude did well. Output rose 28,500 bbl. daily to 117,500 bbl. daily. This was within 5,800 bbl. daily of its 1956 average.

Iranian output declined 7,000 bbl. daily to 524,000 bbl. daily. This compared with a yearly average of 538,000 bbl. daily. Bahrain produced its usual 30,100 bbl. daily. Virtually all its output is delivered to the island's 205,000-bbl. daily refinery.



Deep Play Pays Off

Promising trend shaping up in Venezuela's Greater Oficina area; two wells prolific, two testing along 10-mile line

DEEP drilling has located a new and extensive east-west producing trend that is making Eastern Venezuela's best discovery in years look even better.

Venezuelan Petroleum Co. (Sinclair) started it all last October with its major discovery at Aguasay 3. Since then here's what happened:

... Five miles to the west, the Sinclair subsidiary is drilling below 13,135 ft. in a wildcat that has encountered "good sand sections." Nothing more is being said officially about these sands, but they presumably are just as good as those which tested more than 1,300 bbl. daily in Aguasay 3.

... Another 5 miles west, Mene Grande Oil Co. (Gulf) is still making extensive tests to determine just how good a well it has at Zulus 1. The wildcat was drilled to a total depth of 13,649 ft. just 1½ miles southwest of the border of Sinclair's acreage. The well is almost in a direct east-west line with Aguasay 3 and 4.

... Caro 1, an offset to Aguasay 3, is now being completed as a well equal to or better than the pool opener. The well has 290 ft. of pay sand in three separate zones. It was drilled to 13,330 ft. by Venezuelan Atlantic Refining Co.

Location is just inside the 13,411-acre San Jose de Guanipa concession held jointly by Atlantic and Pancoastal Petroleum Co., C.A. Caro 1 was drilled after the two companies contributed to the costs of nearby Aguasay 3.

... Eight-inch pipe for a crude line to link the new Aguasay field with a trunk line to the north is already on the ground in Venezuela.

The trend . . . The more than 10-mile spread between Aguasay 3 and Zulus 1 indicates a trend which is characteristic of the other producing fields in this Greater Oficina area. Most of the fields trend east and west.

To the east, the drilling has not been so encouraging. The second well Sinclair drilled after completing Aguasay 3 was Aguasay 3-2, about 3,000 ft. to the south and east, located a fault. It was a disappointing well compared to the discovery. It will produce about 300 bbl. daily.

To the north another 3,000 ft., the company is drilling Aguasay 3-3, but it has not yet gone deep enough to show any significant results.

The discovery . . . The Sinclair company drilled Aguasay 3 after its first two tests to the south proved to be only minor successes. Aguasay 1 and 2 produce about 100 bbl. daily.

The third well was drilled to 14,221 ft. It found several productive sands more than 200 ft. thick. Late in September initial tests on one horizon produced 689 bbl. daily of 35°-gravity oil *(The Oil and Gas Journal, October 1, 1956, page 70).*

A second and higher zone was tested in October and Sinclair said it was just as good as the first. The company completed the well without testing other horizons encountered higher up in the hole *(The Oil and Gas Journal, October 29, 1956, page 83).*

The pipeline . . . The 8-in. pipe to furnish the field with an outlet was obtained in the United States from Sinclair Pipeline Co. after lines in the Southwest were salvaged. Construction on the line will start as soon as a permit is obtained from the Venezuelan Government.

The line will be laid north for 30 miles to meet a 16-in. crude line from Santa Barbara to Puerto La Cruz on the coast. The 16-in. line is owned jointly by Sinclair, Mene Grande, and Creole Petroleum Co. (Jersey Standard).

Syrian Deal Brews

Second American company dickering for concession

A SECOND American company is believed ready to explore for oil in Syria.

Reports say H. L. Dillon & Co. has received permission for the search from the Syrian Ministry of Public Works and that the firm has opened a credit of $50 million to carry it out. Personnel are reportedly due to arrive in the country shortly.

J. W. MenHall, owner of the J. W. MenHall Drilling Co. of Benton, Ill., gave the country its first production last year with a discovery in the northeast corner of Syria *(The Oil and Gas Journal, November 5, 1956, page 85).*

One other company currently has prospecting rights in Syria. It is Soc. des Petroles "Concordia" of Damascus, an affiliate of Deutsche Erdoel, A. G. The West German firm has an area of 5,800 sq. miles under concession.

Israel Liberalizes Oil Law

Israel is going all-out to entice oil exploration in the country. A new amendment to the country's Petroleum Law of 1952 exempts all oil firms and drilling contractors from payment of sales and excise taxes on locally produced materials.

The amendment also grants drilling contractors exemption from customs duties. Formerly, this applied only to companies holding oil licenses. All new exemptions are retroactive to April 1, 1954.

Important materials covered by the excise exemption include cement and rubber tires. Tax on cement, for example, is now about $31 per ton. Sales tax in Israel averages about 18 per cent.

French Official Visits Sahara Discovery

THIS is what has an oil-hungry France so excited.

Maurice LeMaire (center) French Secretary for Public Works took a look for himself last week on a tour of French oil operations in the vast Sahara region of southern Algeria. He saw this flow at Hassi Messaoud, more than 500 miles south of Algiers.

The French have revealed no analysis of this crude, but say it is of such good quality that it is being used for diesel fuel at the well site. The French say this single well can produce from 1,800 to 2,500 bbl. daily and further drilling will develop an 8,500 to 10,500-bbl. daily field by next year *(The Oil and Gas Journal, December 31, 1956, page 104, and February 18, page 118).*

After his return to Paris last week, LeMaire confidently predicted that Sahara oil will reach the Mediterranean coast by pipeline in 1960. He said a pipeline will be moving Hassi Messaoud crude and also the oil from Edjele and Tigentourine near the Algerian-Libyan frontier. Plans are being made by the French steel industry for necessary pipe.

New Firm to Hunt Foreign Oil

HOUSTON.—A former associate of DeGolyer & MacNaughton, Dallas consulting firm, has formed a company to explore for oil and gas in foreign countries.

Known as T.U.L.M. Corp., the new firm is under exclusive contract to four U. S. oil producers. They are Tennessee Gas Transmission Co., Union Oil & Gas Corp. of Louisiana, Lion Oil division of Monsanto Chemical Co., and Murphy Corp.

President of the new firm is Earle F. Taylor, who until recently was in charge of foreign operations for DeGolyer & MacNaughton. Taylor worked for the famous geological firm 10 years. He was a member of its board and a senior vice president. He also held high posts with three subsidiaries of DeGolyer & MacNaughton.

T.U.L.M. Corp. will look for oil outside the United States and Canda and their offshore areas. Its work will include geological studies, purchase of concessions and leases, and consultation during wildcat drilling. Its job will end when commercial production begins.

EARLE F. TAYLOR
. . . leaves DeGolyer & MacNaughton

Venezuela stake . . . Tennessee Gas, Union of Louisiana, Lion Oil, and Murphy Corp. recently joined forces to stake their first claim in Venezuela. Subsidiaries of these companies, together with a subsidiary of San Jacinto Petroleum Corp., acquired three concessions in Venezuela from Venezuelan Leaseholds, C.A. *(The Oil and Gas Journal, October 1, 1956, page 70.)* Two of the blocks are in Lake Maracaibo and the other is along the Colombian border.

Headquarters for T.U.L.M. have been set up in Houston. The firm is now forming a staff experienced in foreign oil work.

A veteran of 20 years in the oil and gas industry, Taylor has had experience in many foreign countries. Before joining DeGolyer & MacNaughton he worked for National Development Co. in the Philippine Islands and National Petroleum Council of Brazil. During part of World War II he was assigned to the Office of Naval Petroleum Reserves.

Peru Deal Planned

Jersey affiliate may buy interest in Lobitos tract

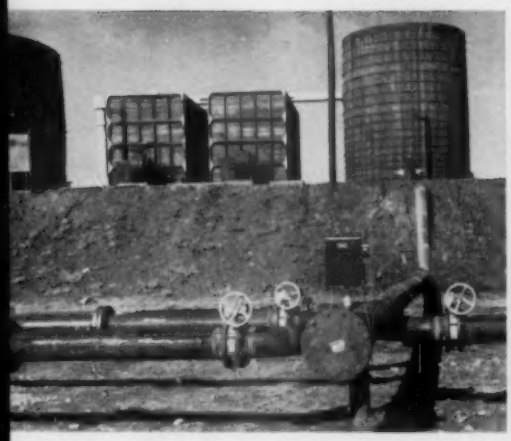
INTERNATIONAL PETROLEUM CO., LTD., has reached a preliminary agreement to buy half interest in a 138,000-acre concession in Peru held by Lobitos Oilfields, Ltd.

The acreage is in the northern coastal region, adjoining International's La Brea-Parinas fields. The Standard Oil Co. (N. J.) affiliate said the area holds the best prospects for developing additional production in the near future.

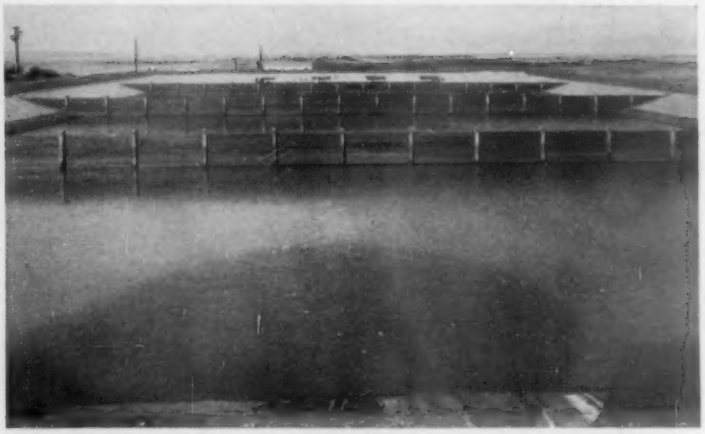
If the Peruvian Government approves the deal, the concessions will be developed jointly. International would pay $18 million for the half interest and would be obligated to spend at least $40 million for field development by the end of 1961.

International and Lobitos already have a joint operation on two extensions of the Lobitos producing area. These areas produce about 6,000 bbl. daily. International's La Brea-Parinas fields produce about 28,000 bbl. daily.

Lobitos intends to spend $8 million of its proceeds for development work in Peru. The British company would spend the remaining $10 million on its Canadian interests, to replace a tanker, and to modernize its 4,000-bbl. daily refinery at Elesmere Port, England.



RAW WATER from Arbuckle wells enters this header where it's metered. Then it passes to skimming tank, forced-draft aerators, and surge tank.



SEDIMENTATION BASIN takes water from aerators. Iron oxides and other precipitates from aeration settle out. Redwood baffles across the basin force uniform water movement and complete settling. The basin is lined with an asphalt mastic.

Automation Applied to Flooding at Naval

AUTOMATIC control and monitoring is a feature of the rapidly expanding water flood in Naval Reserve pool, west-central Osage County, Oklahoma. The Texas Co., operator for this fully unitized flood, has provided water-production controls, water-throughput controls, automatic filter backwashing, and injection-well regulation. The water-treating and injection system can handle up to 50,000 bbl. per day but requires only one man for operation.

Naval Reserve pool is unusually well suited for water flooding. It lies south-southeast of other well-known Red Fork-Burbank sand fields which also are under water-flood operation—North Burbank, Mid-Burbank, and South Burbank.

In Naval Reserve pool, the Burbank sand depth is about 2,650 ft. and pay-sand thicknesses are from 10 to 70 ft. Crude-oil gravity is 38°-39°, and the production is of the dissolved-gas expansion type.

Pilot flooded . . . Texaco and the other Naval Reserve participants unitized the pool October 1, 1951, and inaugurated a pilot water flood consisting of two 20-acre five-spots. First water injection commenced in December 1952. Oil-production response was good, and the water-flood development has now been expanded until there are 16 water-injection wells in operation and approximate 20 producers directly affected.

The present water-flood development area lies in the southern portion of the unit and encompasses about 300 acres. Since the total unitized area is 4,960 acres, the present development is only some 6 per cent of the total.

With considerable expansion ahead in water-flood development, the unit operator has constructed water supply and centralized water treatment, and injection facilities to care for not only the present south area but also the central and northern areas of the total unit. The original pilot-plant water-treating and injection facilities are located in the southern portion of the unit.

Water-Supply Wells

There are no surface-water supplies available to the Naval Reserve area and the shallow water sands are not prolific producers. Therefore, in commencing the south-end pilot flood in 1952, the operator drilled an Arbuckle limestone supply well. Prolific water production was found at 3,000 to 4,000 ft. This water needs treatment as considerable H_2S is present (60 p.p.m.) and the pH is as low as 6.0.

For new water facilities, the operator has drilled additional Arbuckle water wells on the west side of the pool for a present total of three wells. Static water level averages 600 ft. from the surface.

The three wells are equipped with 100-hp. 15-stage electric submersible pumps. The water wells will produce about 10,000 bbl. per day each. Each well is remotely controlled by an electrode well adjacent to a 50,000-bbl. settling pond. The electrode well has the same water level as the pit. Electrodes send signals over control wires to the three Arbuckle wells, and successively turn on one, two, or three pumps. The three water-supply wells pump into 8-in., Class 150 asbestos-cement lines leading to a 700-bbl. 16 by 20-ft. redwood surge tank. There is an adjoining 30 by 20-ft. redwood skim tank of 2,500-bbl. capacity for produced water.

Aeration . . . Raw water moves from the tanks through two 9-ft. wide by 18-ft. long by 12-ft. high, large capacity, enclosed aeration units made of redwood with plastic distribution and splash trays. Air is supplied by four 2-hp. squirrel-cage blowers, electrically driven. The total aeration capacity is 100,000 bbl. of water per day.

The water moves from the aerators through a 50,000-bbl. sedimentation basin lined with asphalt sheets, 4 ft. by 12 ft. by ½ in. There are three parallel baffles which force the water to move uniformly through the pit.

Chemical Treating

Raw water leaves the sedimentation basin through an asbestos-cement draw-off and travels by gravity down to a rapid reactor. The tank is a 45-ft.-diameter, 15-ft.-high, redwood open-top vessel housing the treating unit.

The treating unit is steel. It consists first of a conical shaped, primary mixing chamber where chemicals are mixed into the raw water with rotating paddles. Next is a secondary mixing chamber, above the primary, to which the water is pumped by rotating impeller.

The author is Naval Reserve Unit engineer, Fairfax, Okla.

CHEMICAL TREATMENT occurs as water leaves settling basin. Water enters rapid reactor, left, as lime, alum, and chlorine are added from building. The unit stabilizes the water and reduces turbidity to less than 10 p.p.m.

REACTOR FEED line is 12 in. Flow from settling basin is by gravity. A stainless-steel butterfly valve with the pneumatic controls shown regulates rate.

Reserve Pool

by Morris Todd

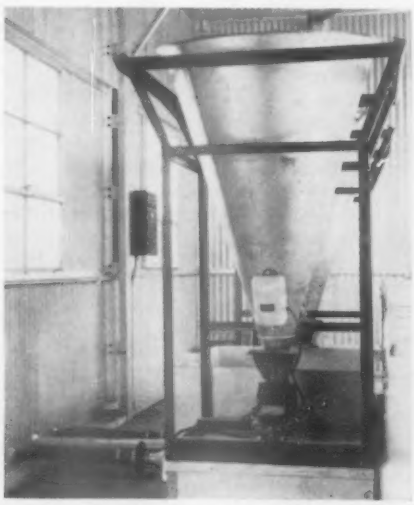
This and the following four articles give you a good look at some important production operations today. Besides water flooding, you'll want to read about developments in automatic custody transfer, new ways of fracturing and acidizing wells, and a new method of analyzing logs of shaly sands. It's all here.

Background facts and figures on Naval Reserve pool

NAVAL Reserve pool, Osage County, Oklahoma, gets its name from that applied when Osage tribal lands were under consideration by Congress for naval reserves. This legislation was not enacted, but the name stuck. Operation of the unitized water-flood project is by The Texas Co. which has 58.59 per cent participation. Others participating are Continental Oil Co. (15.05 per cent), The Chicago Corp. (12.85 per cent), Sinclair Oil & Gas Co. (4.01 per cent), Gulf Oil Corp. (3.92 per cent), Tidewater Oil Co. (2.85 per cent), Skelly Oil Co. (1.64 per cent), Phillips Petroleum Co. (0.80 per cent), and others (0.30 per cent).

At the time Naval Reserve pool was unitized, October 1, 1951, there were a total of 256 wells. As of December 1, 1956, there were 329.

During the current expansion program from pilot stage to full water-flooding operations, there have been 15 new water-injection wells drilled, 4 new secondary oil wells drilled, 2 new water-supply wells drilled, and 17 conversions from producers to water injection. Also, there have been 41 wells drilled, concurrently with the water-flood expansion, as additional development in the Burbank sand. During the last half of 1955 and during 1956, from one to three drilling rigs and two to three strings of cable tools have been kept busy.



DRY-CHEMICAL feeders add lime and alum to the raw water. The vibrator-type feeders have 10 cu. ft. of volume.

RAPID REACTOR will handle 50,000 bbl. of water per day. Chemicals mix into water in bottom chambers, then treated water rises through top quiescent zone and leaves through radial launders.

INJECTION STATION is downhill from treating equipment. Treated water flows by gravity from reactor to filters then to clear-water tank. Three two-stage centrifugal pumps can boost water up to 300 psi. into injection lines.

Then there is a quiescent zone where clear treated water rises and enters a series of radial launders that lead to the tank outlet.

This unit achieves water treatment, stabilization, and a reduction of turbidity to less than 10 p.p.m. The rapid reactor vessel has capacity for treating 50,000 bbl. of raw water per day, based on a clear-water rise rate of 1 g.p.m. per sq. ft. of surface area.

. . . **Chemical treatment** is lime, alum, and chlorine. The chemical building is adjacent to the treating tank. It is a two-story building with a lean-to-shed. Lime and alum are stored on the ground floor of the main building in 50 and 100-lb. sacks. The lean-to shed houses the chlorine supply which is in 1-ton steel cylindrical containers.

Dry-chemical feeders and the chlorinator are on the second floor of the main building. The chlorine is piped up stairs. Lime and alum are raised to the second floor with an electric-powed platform hoist. The dry-chemical feeders are conical vibrator type, 10 cu. ft. in volume, that feed to solution boxes.

Water for the solution boxes is raw water from the settling pit. The chemical solutions enter the primary mixing chamber of the treating tank by gravity. The chlorinator takes its solution water supply from high-pressure injection line and has a capacity of 50 to 1,000 lb. chlorine per day.

The quantity of water flow through the treating tank is controlled by a metal - to - metal, 316 - stainless - steel, pneumatically operated butterfly valve. The valve is located just upstream of the treating tank in the 12-in. inlet line. Upstream of the valve is an orifice flange holding a 12 by 9-in. orifice plate.

The differential head across the orifice, caused by the flow of water, is transmitted with air-pressure signals by a bellows-type differential transmitter to a meter (receiver, recorder, controller) mounted in a panel board in the injection building. The flow of water can be controlled by the plant operator from the injection building by setting this meter for the differential desired. Air signals will be sent from the meter to the butterfly valve that will open, or close, the valve until the flow of water will be the desired rate.

Filters

Treated water leaves the rapid reactor and flows by gravity through six pressure filters, each 10 ft. in diameter. The filter media consists of six grades of coal. The influent turbidity will be approximately 10 p.p.m. and effluent turbidity should be from 1 to 2 p.p.m.

The filters are backwashed automatically with a time clock initiating the cycle. Each filter is equipped with two three-way pneumatically controlled diaphragm valves. Air pressure is admitted to and bled from the diaphragm valves through small three-way, normally closed, solenoid valves. The sequence of valve operation for the backwash and rinse of each filter is controlled with a cam sequence timer mounted on a backwash control and monitoring panel located in the injection building.

The backwash pumps are end-suction, single-stage centrifugal pumps, each designed to deliver 950 g.p.m. against 50 ft. of head. They are direct-connected to Design B, 1,800-r.p.m. electric motors. The pump fluid ends are constructed of a high-chromium-nickel alloy. Two identical pumps are installed.

Treated and filtered water flows from the filters to the clear well tank by gravity head from the rapid reactor.

TEXACO PERSONNEL in the Naval Reserve Unit water-flood project are (left to right): G. D. McColl, unit foreman; Van Hambright, production foreman; Morris S. Todd, unit engineer; Clayton R. Reed, petroleum engineer; Marion L. Scott, unit clerk; E. E. Stump, clerk; C. J. Goodwin, clerk; S. E. Self, Jr., water-treating plant and injection-station operator.

PRESSURE FILTERS hold six grades of coal, reduce turbidity to less than 2 p.p.m. Backwashing is controlled by timed three-way pneumatic diaphragm valves.

ORIFICE in injection line meters flow. Transmitters send air signals of pressure and rate to injection house.

This is a 5,500-bbl., 50-ft. diameter by 16-ft. high, redwood vessel with 3-in. bottom and 3-in. staves. The tank has a single-thickness sundeck.

The injection pumps are two-stage centrifugal pumps, with horizontally split cases, each designed to deliver 555 g.p.m. against 610 ft. of head (300 psi.). The suction end of each pump is 6 in., the discharge end is 4 in. Each pump is direct-connected to a 200-hp., Design B, 3,600-r.p.m. electric motor. Like the backwash pumps, the fluid ends of these pumps are constructed of a high chromium-nickel alloy. There are three identical pumps installed with foundation blocks poured for two future installations.

Control and Monitoring Panel

The control and monitoring panel board is located in the northeast corner of the injection building. The backwash control and monitoring features have been previously discussed. Other control and monitoring features are: (1) the single-pen meter (receiver, recorder, controller) that records the rate of water flow through the treating plant and controls this rate with an air-pressure signal to a pneumatically controlled butterfly valve (previously discussed); (2) a single-pen meter that makes a continuous chart recording of the changing fluid level in the clear-well tank; (3) a two-pen meter that makes a continuous chart recording of the injection-plant output pressure and flow differential across a 14 by 10½-in. orifice plate.

There are a series of relays mounted on the panel that are connected with electrodes in the clear well. The purpose of these relays is as follows:

1. Shut down injection pumps and sound alarm at low tank level.
2. Prevent or stop the backwash cycle at low tank level.
3. Sound alarm at high tank level.
4. Close control valve, upstream of rapid reactor, at high tank level.

One-Man Operation

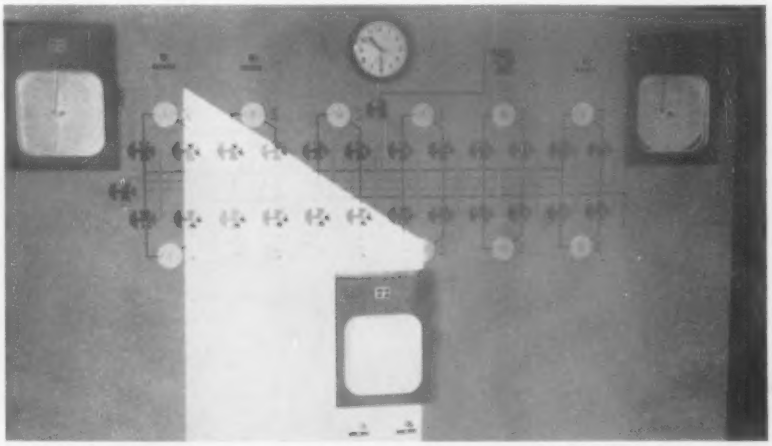
Such advanced water-handling equipment lets one man operate the entire water system — three 4,000-ft. supply wells, aeration units, sedimentation basin, chemical feeders, rapid reactor unit, six filters, and three 200-hp. centrifugal injection pumps. This is very efficient handling of a water-injection system which has current rating up to 50,000 bbl. per day.

The main injection line leads south from the water-injection building for a distance of approximately 2½ miles. The line sizes grade from 14-in. o.d. to 12¾-in. o.d. to 10¾-in. o.d. to 6⅝-in. o.d. The line is currently prepared to serve three 24-well distribution headers. It has provisions for attaching two future headers, and is designed to handle 75,000 bbl. of water per day against 1,000 psi.

Each well is equipped, at the header, with a high-pressure choke for regulating the rate of injection. The injection rates are metered with bellows-type orifice meters. Upstream of each flow control choke is a 2-in. meter run with an orifice flange. There is one meter for each 12 injection wells.

Adjacent to each water distribution header is a 24-well production header. Each production header is equipped with a free-water-knockout-type well-test unit. The production from each well is pumped to one of the headers where it is joined with the production from other wells and pumped through 6-in. and 8-in. trunk lines to a consolidated tank battery.

There are two consolidated tank batteries in the Naval Reserve Unit. One serves the south one-third of the unit and the other serves the north two-thirds of the unit. The basic tank battery design includes horizontal free-water knockouts, vertical heater-treaters, and stock tanks. **End.**



PANEL BOARD monitors operation of automatic filter backwashing equipment, uses amber and green lights. Meters keep record of other parts of the plant operations.

AUTOMATIC TRANSFER tanks are the two at left. One is for metering, the other for overflow. Gager checks in the two adjacent tanks have shown only 0.024 per cent difference in 8,250 bbl. of oil.

The Texas Co. Installs an

Experimental L.A.C.T. Battery At Naval Reserve Unit

by C. R. Reed

IN an experimental automatic-custody-transfer tank battery in the Naval Reserve Unit, west-central Osage County, Oklahoma, The Texas Co. checked out with only 2 bbl. difference against the pipeline tankage gages during sales runs, totaling 8,250 bbl. of crude oil. This is a remarkably close agreement with the difference being only 0.024 per cent.

The Naval Reserve installation consists of four 400-bbl. steel storage tanks. One is the metering tank, another serves as an overflow tank, and the other two are designated as sales tanks. The oil goes into the metering tank and is then pumped into the sales tanks and is run by the gager in the conventional manner.

Author is engineer for automatic custody transfer, Naval Reserve Unit.

Operation . . . The metering tank is filled from the bottom through the lower weir. When the oil reaches a level of approximately 3 in. above the upper weir, a microswitch is operated closing the inlet valve. A drawdown valve opens, and oil is drained out through the upper weir until the oil level is at the top of the upper weir. Next, the air supply to the instruments is turned on automatically and the temperature, gravity, and base sediment and water of the oil in the metering tank are measured and recorded on a strip-chart recorder.

The instruments all record on a 3-15 psi. signal output, and if any one of the instruments does not record within this range, the circuit is opened, a siren blows, and the sequence of operations is stopped. Thus, if the b.s. and w. content of the oil is beyond the acceptable limit, the oil will not be delivered to the pipeline.

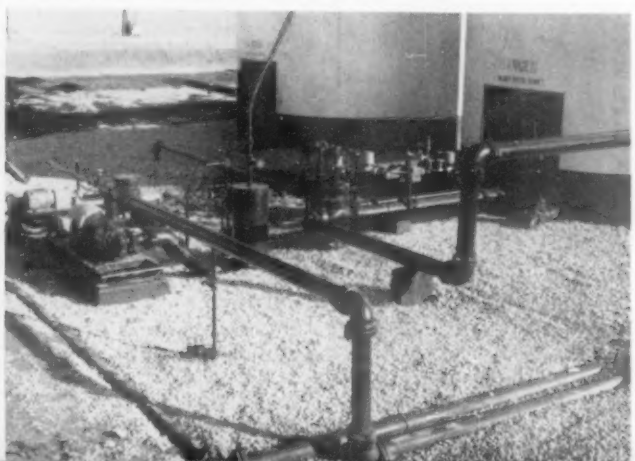
After the recording period is completed, a discharge valve opens allowing the oil to go into a float box. The oil level in the float box rises and operates an upper float switch which starts the pipeline pump. Pumpout continues until the oil is at the lower weir, at which time the level in the float box drops and a lower float switch shuts off the pump. The discharge valve closes and the inlet valve opens and the metering tank is again ready to fill.

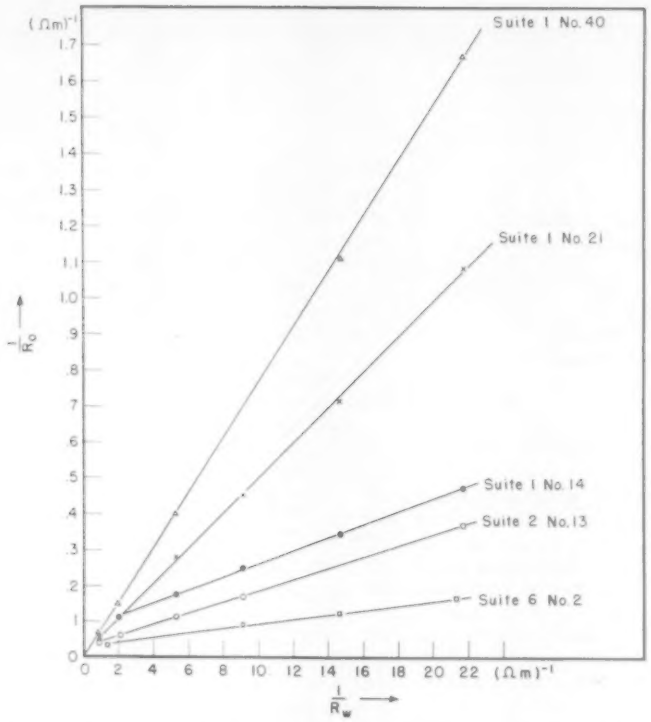
An automatic sampler operates during the pumpout sequence, and continuously takes a small increment of the oil and stores it in an enclosed cylinder. Thus, a composite sample is collected and gravity and b.s. and w. can be determined from this sample.

Plans are presently under way to make the necessary changes to permit pumping the oil from the metering tank directly to the pipeline.

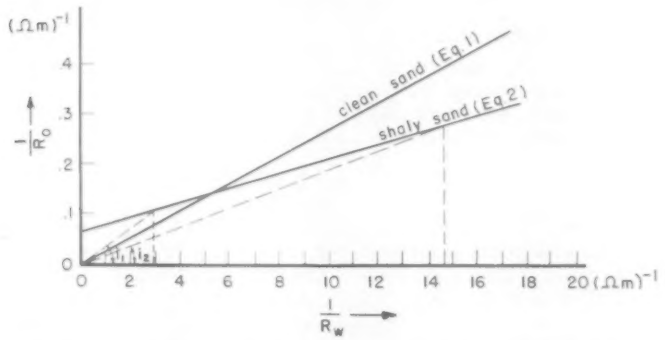
SAMPLER in foreground takes and stores a composite oil sample during meter-tank runs. This sample is used to check the automatic gravity and b.s. and w. measurements.

PIPELINE PUMP transfers oil from metering tank into adjacent sales tank for conventional checking. A similar pump shown behind sampler in picture at left feeds oil from overflow tank to meter tank.

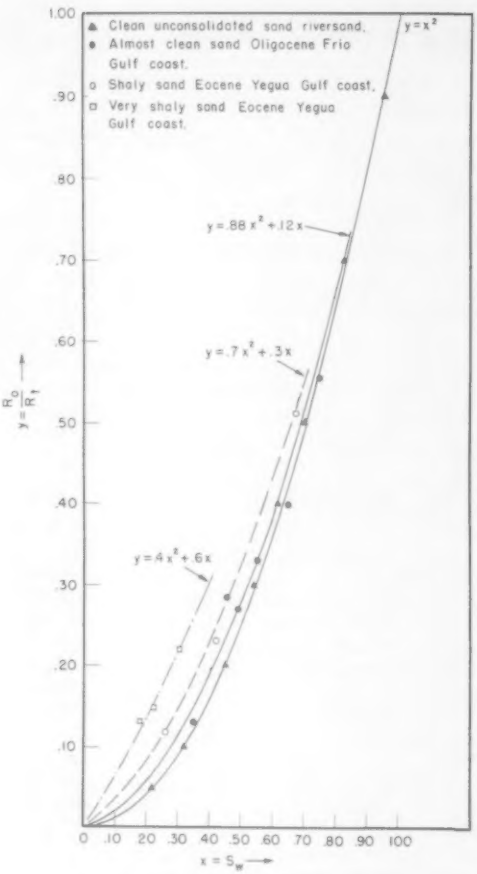




WATER-SATURATED-ROCK conductivity plotted against water conductivity yields linear curves for these measurements by Hill and Milburn.[8] Fig. 1.



CONDUCTIVITY RELATIONSHIP for shaly sand is a linear curve that does not pass through the ordinate. Formation factor is thus a function of water resistivity. Fig. 2.



RELATIVE CONDUCTIVITY (R_o/R_t) plotted against water saturation yields a family of curves looking like parabolas for different sands. Fig. 3.

Special Producing Section

An engineering approach to problem of determining

Saturation and Porosity From Electric Logs in Shaly Sands

by A. J. de Witte

Part 1

THE electrical properties of the ground have attracted the attention of geophysicists since the early days of electrical prospecting.[1,2] Their study received especial emphasis when electric logging became an important tool in the oil industry.

It was soon noted that the conductivity of rocks should be directly proportional to the conductivity of the fluid contained in the pores if the mineral components of the rocks themselves could be regarded as nonconductive.[1,2,3] The same, of course, is then true for the resistivity.

The proportionality constant between the rock resistivity and the resistivity of the saturating fluid was called the "resistivity factor" by Sundberg (1932).[1] He stated that the resistivity factor was **dependent on the porosity,** but not on the permeability of a rock, and calculated this factor for a few different packings of spherical grains.

Later, the proportionality constant was termed "formation resistivity fac-

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"It's a controversial subject . . ."

The subject of log interpretation in shaly sands is still a controversial one. Some of the theoretical arguments involved are so far removed from the normal sphere of interest of the nonspecialist that they require a take-it-on-faith attitude on his part.

Main object of this two-part article is to bring this matter down to earth so that the interested, educated reader can follow the presentation. It is a complete and self-contained treatment of the subject.

Part 1 discusses the resistivity relations between clean and shaly sands. Part 2 will present new nomographs for computing saturation and porosity.

tor" by Archie (1942),[4] and his notation:

$$R_o = F R_w \qquad (1)$$

for the relation between the resistivity of a water-saturated sand (R_o) and the resistivity of the water (R_w) is now widely accepted in standard logging practice,[5] F being commonly referred to as the "formation factor." The aforementioned relation between the formation factor and porosity was also experimentally investigated by Archie,[4] and since then by many others. They found, indeed, a rather close correlation between the two. As may be expected, the formation factor increases as the porosity decreases and vice versa. A crossplot on log-log paper shows that the trend follows more or less a straight line.

The shaly-sand problem . . . The condition that the mineral grains of the rocks are nonconductive (or electrically inert) is satisfied in many rocks. It is customary to call these rocks "clean sands."

There are, however, some important rock-forming minerals, mainly of the zeolite and notably the clay-mineral families, which through their base-exchange capacity are capable of transmitting electric current. Rock constituents of this type have been variously termed "conductive solids," "colloidal particles" or "ion-exchange materials" and the like. An important class of rocks in which they occur are shales and shaly formations. The latter, in electric-logging jargon, have been dubbed "shaly sands" or "dirty sands."

In the following, the distinction between clean and shaly sands will be made frequently, the clean sand being an ideal limit (one side of a sequence, on the opposite side of which is shale). The rules for quantitative log interpretation were first established for clean sands. Intuitively, oil-bearing sands are associated with high resistivity because oil is an insulator. Practical experience, however, showed that prolific oil production often came from shaly sands which had moderate to low resistivities. To explain this fact and to devise rules for quantitative log interpretation applicable to shaly sands became a problem known as the "dirty-sand problem." It held the center of discussion among log interpreters for years and has been the subject of many investigations to the point that it threatens to become trite.

Electrical Properties Vs. Fluid Contents

The relations between the electrical parameters and the fluids contained in shaly sand are all a degree more complicated than the corresponding relations for clean sands. We shall examine them one by one.

1. Conductivity of Water-Bearing Sands

The straight proportionality expressed by Equation 1 with constant F for clean sands is no longer valid for shaly sands. Instead, experiments on shaly-sand cores show that the conductivity is given to a close approximation by the equation:

$$\frac{1}{R_o} = A + \frac{B}{R_w} \qquad (2)$$

Equation 2 may not be exact for large values of R_w, but it holds true enough over the range of R_w which is of practical interest in log interpretation (i.e., $0 < R_w < 5$ ohm-m.). Originally found by Patnode and Wyllie,[6] it has been confirmed many times over again.[7*]

Applied to the invaded zone of a water sand, in which the interstitial water has been replaced by mud filtrate of resistivity R_{mf}, Equation 2 may be written:

$$\frac{1}{R_{io}} = A + \frac{B}{R_{mf}} \qquad (2a)$$

We see at once that the idea of a constant formation factor, characteristic for clean sands, strictly loses its meaning for a shaly sand. The ratio R_o/R_w for a shaly sand becomes:

$$\frac{R_o}{R_w} = \frac{1}{A + B/R_w} \times \frac{1}{R_w} = \frac{1}{A R_w + B} = F_a \qquad (3)$$

which is clearly variable with R_w. For instance, if F_a is determined from Equation 2a, we get:

$$F_a = \frac{R_{io}}{R_{mf}} = \frac{1}{A R_{mf} + B} \qquad (3a)$$

The variable F_a is called the "apparent formation factor."

In a plot of Equation 2, F_a is found as the cotangent of angles such as i_1 and i_2 (Fig. 2). For very conductive solutions ($R_w \to 0$), F_a approaches a limiting value which is the inverse of the slope of the straight line representing Equation 2.

One may define this constant limit as the "maximum formation factor" of the shaly sand thus:

$$F_m = \lim_{R_w \to 0} F_a = \lim_{R_w \to 0} \frac{1}{A R_w + B} = \frac{1}{B} \qquad (4)$$

This quantity F_m is useful because measurements of (apparent) formation factor for the purpose of correlation with effective porosity, are normally made with very conductive solutions so that the measured F_a is close to F_m. These correlations may therefore be used indiscriminately for shaly and clean sands provided the proper "maximum formation factor" $F_m = 1/B$ is used in the case of the former.

The following relation between any "apparent formation factor" F_a and "maximum formation factor" F_m is readily established. From Equation 3:

$$F_{a1} = \frac{R_o}{R_w} = \frac{1}{A R_w + B} = \frac{1/B}{(A/B) R_w + 1} = F_m \frac{1}{(A/B) R_w + 1} \qquad (5)$$

Alternatively, from Equation 3a:

*In a recent article by Hill and Milburn,[8] a considerably more elaborate expression was proposed. This is unnecessarily complicating an already complex matter, seeing that even the data they reported may be represented very well by Equation 2 if one makes allowance for some irregularity of the plotted points (Fig. 1).

$$F_{a2} = \frac{R_{io}}{R_{mf}} = \frac{1}{A\,R_{mf} + B}$$

$$= F_m \frac{1}{(A/B)\,R_{mf} + 1} \qquad (5a)$$

In actual log interpretation practice, F_a is determined from Equation 3a as the ratio of the mud filtrate resistivity R_{mf} and the resistivity of the invaded zone R_{io} which is measured by a logging device of short electrode spacing (see, for instance, Schlumberger[9]).

Shaliness factor . . . The quantity A/B in Equation 5 is a measure of the shaliness of the sand. This may be appreciated from the following consideration relative to Fig. 2. In this figure, Equation 1, valid for clean sand, is also shown. It is represented by a straight line through the origin. Since for this line A = 0, the shaliness of the sand as measured by A/B is zero, or the sand is clean.

Let the ratio A/B be called the "shaliness" for brevity. To the extent that Equation 2 holds, the shaliness A/B is, like the formation factor in clean sands and the "maximum formation factor" for shaly sands defined above, a characteristic of the rock or an absolute rock parameter, being independent of R_w. For any given R_w, however, it determines the relative importance of the terms with and without R_w in the conductivity expression (Equation 2). The mechanism of the conduction is here left completely out of the consideration.

It follows from Equation 2 that for low R_w the second term will preponderate. As will also be noted from the equation, the shaliness has the dimensions of a conductivity and therefore depends on the units chosen. If the R's are in ohm-m. the ratio A/B **is in reciprocal ohm-m.,** mho/m. or $(\text{ohm-m.})^{-1}$. It then ranges in numerical value from 0 to about 5 between clean sands on the one hand and extremely shaly sands on the other.

2. Resistivity of Oil-Bearing Sands

The variation of the resistivity of porous rocks when the water in the interstices is gradually replaced by oil was studied by early investigators.[3,10] As might be expected, the resistivity increases continuously with increasing oil saturation, at first rather slowly, then more and more rapidly.

Wyckoff and Botset,[11] and later Leverett,[12] established the relation between conductivity of sand cores and their water and gas or oil content. They expressed the conductivity at partial oil saturation as a percentage of the initial conductivity of the completely water-saturated core and plotted this relative conductivity against the water saturation, the latter defined as percentage (or fraction) of the pore space filled with water. (By difference, then, the oil saturation is defined as the fraction, 1 — water saturation; or the percentage, 100 — water saturation.) Conversely, they used the curves so obtained to determine the water saturation of a core from its resistivity at any stage during flow experiments.

At this point Archie[4] noted that if these curves of relative conductivity versus water saturation were plotted on log-log paper, there resulted very nearly straight lines passing, of course, through the point (1,1) since, obviously, the relative conductivity equals 1 at total water saturation. He expressed this result by the equation:

$$R_o/R_t = S_w^n \qquad (6)$$

the general form of a straight line through (1,1) on log-log paper, where:

R_o = denotes the resistivity of a rock 100 per cent water saturated.
R_t = denotes resistivity of the same rock partially water saturated.
S_w = denotes the partial water saturation (as a fraction of total pore space).
n = is an exponent, generally unknown, varying with the nature of the rock.

These designations have once more become standard.[5]

It was observed in particular that in clean sands such as Wyckoff and Botset[11] and Leverett[12] used, the value of the exponent n was very close to 2 so that the saturation equation for clean sands could be written as:

$$S_w = (R_o/R_t)^{1/2} \qquad (7)$$

or by Equation 1:

$$S_w = (F\,R_w/R_t)^{1/2} \qquad (7a)$$

In general, n is said to vary from about 1.5 to 2.5, **values lower than 2 being found in shaly formations.** Although higher values than 2.5 have been reported, the accuracy of the experiments in these cases is questionable.

Equation 7 is known as the square-root relation. The square-root formula has become to cornerstone of quantitative log analysis. Some people refer to it as Archie's law,* which sounds rather exaggerated for an approximate rule of limited application. At any rate, the relation is an entirely empirical one. No one, to the writer's knowledge, has ever given a theoretical derivation of it. Its approximate validity, however, has been verified many times.[7]

In formations other than clean sands, one would have to use Equation 6:

$$R_o/R_t = S_w^n$$

Equation for shaly sands . . . For the practical application of Equation 6,† however, there is **the big handicap** of the unknown exponent n. It is out of the question to determine the n experimentally on cores for every zone in a well on which a log analysis has to be made. This would defeat the very purpose of electric log analysis. Somehow this obstacle must be circumvented.

In shaly sands a value of n lower than 2 has to apply if we are to explain that for a given oil saturation R_t/R_o is lower than in clean sands or, in other words, that the contrast in resistivity between oil and water sands is less in shaly than in clean sands. We may approach the problem in a different manner as follows. From Equation 7 the conductivity of a partially oil-saturated clean sand can be written approximately:

$$1/R_t = 1/R_o \times S_w^2 \qquad (7b)$$

When the conductivity $1/R_t$ of a sand whether shaly or not, or for that matter when the relative conductivity R_o/R_t is plotted versus S_w on **arithmetic graph paper,** it is striking that the curves for different sands **all** look like parabolas (Fig. 3). Equation 7b represents the simple parabola $y = mx^2$. This suggests that the approximate expression be written for the conductivity of a shaly sand:

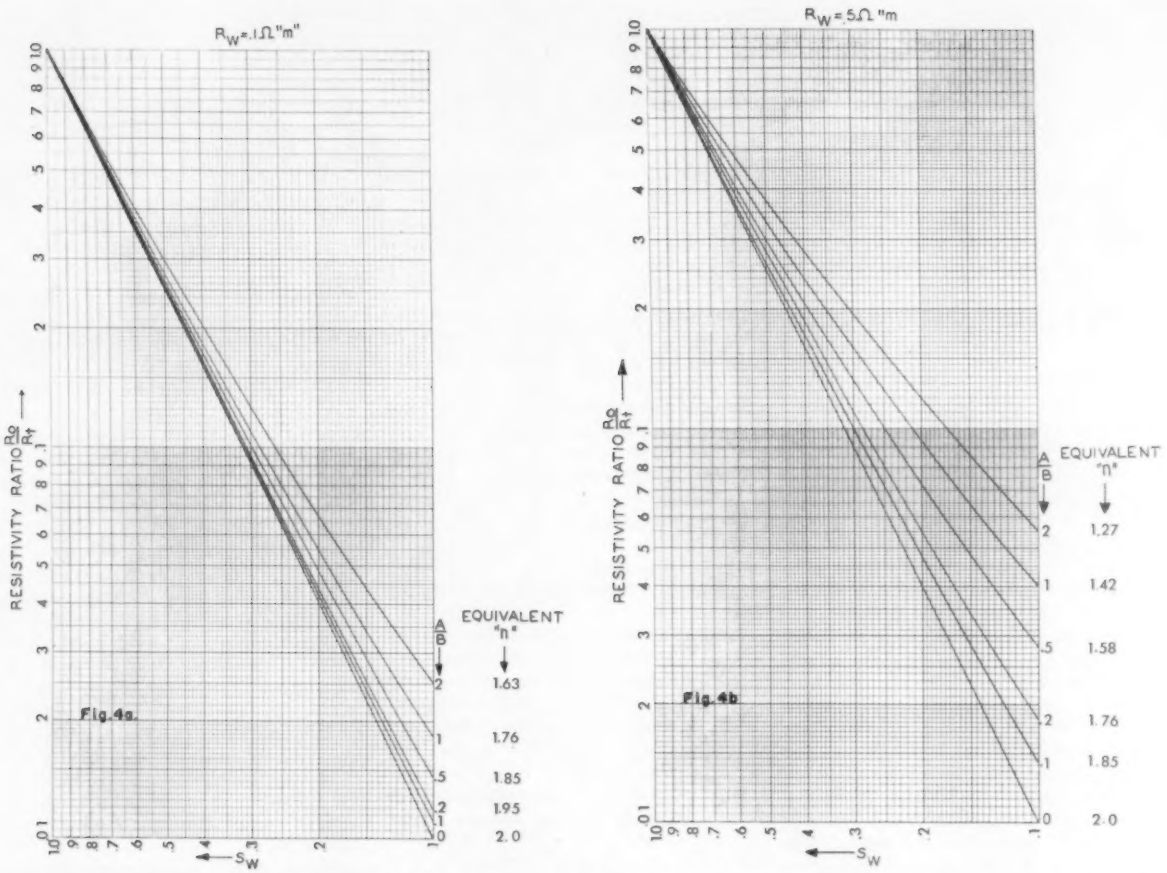
$$1/R_t = m\,S_w^2 + 1\,S_w + k \qquad (8)$$

Essentially this amounts to trying to approach the relation between $1/R_t$ and S_w not by a curve of the type $y = x^n$ called a polytrope, but by a polynomial expression $y = a_0 + a_1x^1 + a_2x^2 \ldots a_nx^n$ which we break off at the second order term. Since S_w varies only over a small range, $0 < S_w < 1$, it is not too far-fetched to fit a parabola to the experimental points of the $1/R_t$ versus S_w plot, especially if it is called for by the shape of the curve.

We shall now try to determine the coefficients in Equation 8 so that it conforms with what is known from experiments on shaly sands; besides, there are some logical requirements that put restrictions on the coefficients. Again,

*It is not too surprising to find roughly a straight-line relationship between two attributes on log-log paper (compare formation factor-porosity correlation mentioned above). A more universal "law" has been flippantly enunciated as: "Anything plotted on log-log paper is a straight line." All one has to do is to look at some resistivity departure curves to realize the overstatement.

†Supposing even that one had a suitable way of finding both R_o and R_t from pertinent resistivity logs.



PLOTS OF PARABOLAS representing the relationship of rock conductivity to water saturation for clean to shaly sands appear very close to curves of the type $y = x^n$. Fig. 4.

what is sought is a practical solution without attempting to explain the mechanism of conduction in oil-bearing shaly sands.

The requirements that have to be fulfilled by Equation 8 are:

1. For $S_w = 1$ we have to have $1/R_t = 1/R_o = A + B/R_w$ since all equations for oil-bearing sands must contain those for 100 per cent water-saturated sands as a special case, viz., $S_w = 1$.

2. For $S_w \to 0$ we expect $1/R_t \to 0$. A totally oil-saturated sand, if such exists, would be an insulator with no conductivity whatever.* This means the coefficient $k = 0$ in Equation 8.

3. For $A \to 0$ in Equation 2, that is, as we get to clean sands, we must have $R_o/R_t \to S_w^2$ (Equation 7a). Furthermore, the coefficients must be so chosen that the equation accounts for the following experimental facts.

4. R_o/R_t versus S_w plots as a quasi-straight line on log-log paper, the equation of the nearest fitting straight line being:

$$R_o/R_t = S_w^n \text{ with } n < 2$$

5. For small R_w it is observed that R_o/R_t approaches S_w^2.

The last observation is one facet of a more general proposition that may be formulated broadly this way: A shaly sand acts less shaly as the interstitial water becomes more saline, or the more saline the water the more nearly a shaly sand behaves as a clean sand. Evidence of this is found, for instance, in Equation 2 where the term B/R_w predominates for small R_w. The same effect is noticeable in the apparent formation factor F_a which is more nearly constant for small R_w values.

In this general category may also be included such a seeming unrelated phenomenon as the swelling of certain clays in contact with fresh water, which does not occur when the water is saline, as though in the latter case there were no clay at all. It is one of the reasons for the use of salty muds in shaly formations (for instance, in the Wilcox, Lower Eocene of the Gulf Coast).

Conditions satisfied . . . It will be seen that the first three conditions are not only necessary but also sufficient mathematically to determine the coefficients in Equation 8 unambiguously, granted the validity of Equations 2 and 7 and the quadratic form of Equation 8. The last two conditions serve as a further test of the applicability of the parabolic approximation.

The solution is rather conspicuous. We write:

$$\frac{1}{R_t} = A\,S_w + \frac{B\,S_w^2}{R_w} \qquad (9)$$

As is readily verified, Equation 9 meets all the necessary requirements. So it is immediately apparent that conditions (1), (2), and (3) are satisfied. As for condition (4), Figs. 4a and 4b show the graphs of R_o/R_t versus S_w (Equations 2 and 9) for several values of A/B and R_w. It is safe to say that these curves could not be distinguished from straight lines through experimental check points in the interval $0.1 \leq S_w \leq 1$. Note that the corresponding

*This is only true if the (hydrated) clay particles are completely disseminated, but even if there were some continuous paths through interconnected particles the conductivity effect in all probability would be so small as to be practically unnoticeable.

straight lines have equations $R_o/R_t = S_w^n$ with various $n < 2$ as marked.

To verify the remaining condition, we have:

$$\lim_{R_w \to 0} \frac{R_o}{R_t} = \lim_{R_w \to 0} \frac{A S_w + (B/R_w) S_w^2}{A + B/R_w}$$

$$= \lim_{R_w \to 0} \frac{A S_w R_w + B S_w^2}{A R_w + B} = S_w^2$$

Inasmuch as Equation 9 seems logical and is in accordance with experience, we accept it as correctly representing the conductivity of an oil-bearing shaly sand, at least to a first approximation.

The shaliness of the shaly sand at water saturation S_w would now be expressed (by analogy to water-bearing sand shaliness) by:

$$\frac{A S_w}{B S_w^2} = \frac{A}{B S_w}$$

Since $S_w < 1$ we see that, relatively, the shaliness (as compared to that of the same sand entirely water saturated) is increased through the oil content by a factor $1/S_w$.

Remark that in the formula:*

$$\frac{R_o}{R_t} = \frac{A S_w + (B/R_w) S_w^2}{A + B/R_w}$$

$$= \frac{(A/B) S_w + (1/R_w) S_w^2}{A/B + 1/R_w} \quad (10)$$

an unknown exponent n no longer occurs so that one should be able to compute saturation S_w from the resistivity ratio R_o/R_t (again, supposed to be determinable from logs) provided the shaliness of the sand A/B and the water resistivity R_w are known. These latter quantities are intimately related to the S.P., as will be discussed in the next part.

*By combining Equations 2 and 9.

References

1. Sundberg, K., "Effect of Impregnating Waters on Electrical Conductivity of Soils and Rocks," Trans. A.I.M.E., Geophysical Prospecting, 367-391 (1932).

2. Hummel, J. N., "Unterlagen der Geoelektrischen Aufschlieszungs Methoden," Beitr. angew. Geoph. 5 (1), 32-132 (1936).

3. Martin, M., Murray, G. H., and Gillingham, W. J., "Determination of the Potential Productivity of Oil-Bearing Formations by Resistivity Measurements," Geophysics 3 (3), 258-271 (1938).

4. Archie, G. E., "The Electrical Resistivity Log as an Aid in Determining Some Reservoir Characteristics," Trans. A.I.M.E. 146, 54 (1942).

5. A.I.M.E., "Proposed Letter Symbols for Electric Logging," J. Pet. Tech. 7 (7), 31 (1955).

6. Patnode, H. W., and Wyllie, M. R. J., "The Presence of Conductive Solids in Reservoir Rocks as a Factor in Electric Log Interpretation," J. Pet. Tech. 2 (2), 47 (1950).

7. De Witte, L., "Relations Between Resistivities and Fluid Contents of Porous Rocks," The Oil and Gas Journal 49 (16), 120 (August 24, 1950).

8. Hill, H. J., and Milburn, J. D., "Effect of Clay and Water Salinity on Electrochemical Behavior of Reservoir Rocks," A.I.M.E. Paper 523-G, fall meeting, New Orleans (October 1955).

9. Schlumberger Well Surveying Corp., "Interpretation Charts for MicroLog," Series B, Schlumberger Document No. 5 (1952).

10. Jakosky, J. J., and Hopper, R. H., "The Effect of Moisture on the Direct Current Resistivity of Oil Sands and Rocks," Geophysics 2 (1) (January 1937).

11. Wyckoff, R. D., and Botset, H. G., "The Flow of Gas-Liquid Mixtures Through Unconsolidated Sands," Physics 7 (9), 325-345 (September 1936).

12. Leverett, M. C., "Flow of Oil-Water Mixtures Through Unconsolidated Sands," Trans. A.I.M.E. 132, 381-401 (1939).

BOOKS

PETROLEUM REVIEW OF LEA COUNTY, NEW MEXICO, by Robert L. Phifer, Phifer Petroleum Publications, Box 20024, Houston. 293 pp. $20.

This is the eighth volume in the Phifer series of petroleum reviews of Permian basin oil-producing counties. This one covers Lea County, the first such review to appear on New Mexico.

Lea County has produced a billion barrels of oil since the discovery at Maljamar field in 1926. There are now 184 fields in the county. Each of these is covered in detail in this new volume. The essential characteristics of each field are listed, along with the exploration history and discovery information, and the status of each pool is outlined as of December 1, 1956.

The volume is replete with structure maps, electric logs, and other illustrations. There is also a detailed survey map of the entire county in color showing location and name of each field.

KANSAS OIL AND GAS POOLS, Volume 1—SOUTH CENTRAL KANSAS. Published by the Kansas Geological Society, 508 E. Murdock, Wichita, Kans. 100 pp., $4.

The Kansas Geological Society has published the first in a series of studies entitled, "Kansas Oil and Gas Pools." The publication was written by Kansas geologists and compiled by the Research Committee of the Kansas Geological Society under the direction of Albert E. Lukken, chairman.

This valuable study includes detailed information on 26 oil and gas pools of South Central Kansas. The writeup on each field includes the method of exploration leading to the discovery, nature of the trap, type of drive, lithology, thickness and continuity of the pay zones, character of the oil or gas, and the production history of the field. Maps and cross-sections are included on each field.

GRAVITY SURVEY OF THE STATE OF OHIO, Report of Investigations No. 30, by W. A. Heiskanen and U. A. Uotila, published by Ohio Division of Geological Survey, Orton Hall, Ohio State University, Columbus. 34 pp. $1.

This report includes two gravity maps and text which explains the methods used in the survey and shows the basic data collected. The maps are of the State of Ohio on a scale of 8 miles to the inch and they show free air and bouguer anomalies. The information was gathered from observations at 1,500 gravity stations along the highways of the state using the Worden gravimeter. A report explaining the geologic significance of these data is in preparation.

AIR POLLUTION HANDBOOK edited by Paul L. Magill, Francis R. Holden, and Charles Ackley. Published by McGraw-Hill Book Co., Inc., New York. $15.

Here is a practical handbook offering much information for analyzing and solving various air-pollution problems. It covers the theoretical, technical, and practical aspects—discusses causes, effects, and controls in chapters covering the science of air pollution.

This book tells exactly what is known about air pollution, how to apply what is known, and indicates where further research needs to be done.

Nelson Refinery Construction Index

Appears in the Engineering Section in the first issue each month.

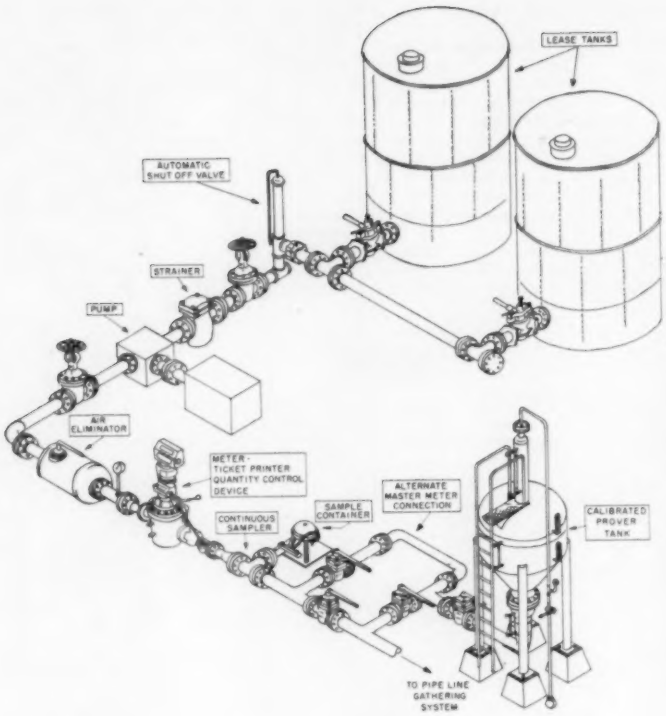
Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.

The Index was explained October 1, 1956 (page 110), as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issues of the months of January, April, July, and October.

Index (1946=100)

	1949	1952	1954	1955	1956	Nov. 1956
Pumps, compressors, etc.	135.9	155.6	166.5	172.2	192.0	200.7
Electrical machinery	130.9	152.4	160.0	162.5	175.0	182.1
Internal-combustion engines	124.8	146.5	150.5	153.2	164.0	170.7
Instruments	123.1	146.2	154.6	162.9	†180.4	181.9
Heat exchangers	133.0	165.8	171.7	156.8	†190.6	197.8
Miscellaneous equipment average	*121.6	153.3	160.7	161.5	†180.4	186.6
Materials component	143.6	164.3	174.6	176.1	†190.4	197.5
Labor component	137.1	163.1	183.3	189.6	198.2	201.5
Nelson construction index	139.7	163.6	179.8	184.2	†195.3	199.9

*Used in computing the Nelson Index until April 1952. This is slightly different from the average of the Miscellaneous Equipment Items shown above. †Preliminary.



Positive-displacement meters accurately measure the flow of oil from lease tanks

Humble Tries L.A.C.T., Gives It Stamp

Experience gained by Humble Pipe Line in measuring 1¼ million barrels shows meters to have a higher degree of accuracy than conventional methods. Procedural errors using abridged A.S.T.M. Table 7 are eliminated. Meters will record correctly though wax encrustation exists in tanks or producer's equipment causes increase in oil flow off lease.

HUMBLE PIPE LINE CO. is using automatic custody transfer at Anahuac field, Chambers County, on the Texas Gulf Coast. The system, which has been approved by the Texas Railroad Commission, uses positive-displacement meters for measuring the flow of oil out of lease tanks into the pipeline. The installation has a printer for providing printed run tickets, a preset device for limiting the run to a desired set figure, a temperature-compensating mechanism, and a continuous sampler.

In test runs, Humble measured 1.25 million barrels of crude oil both by p.d. meters and hand gaging to obtain conclusive evidence that the meters are completely reliable and more accurate than conventional methods.

Additionally, 100 million barrels of natural-gasoline receipts and 58 million barrels of finished products have been measured with complete satisfaction.

The encrustation of interior tank surfaces which affects the internal volume has no effect on meter measurements. Likewise, failure of production equipment which might deliver more oil to a pipeline than that hand gaged has no effect. In all cases, only the oil which enters the pipeline is measured.

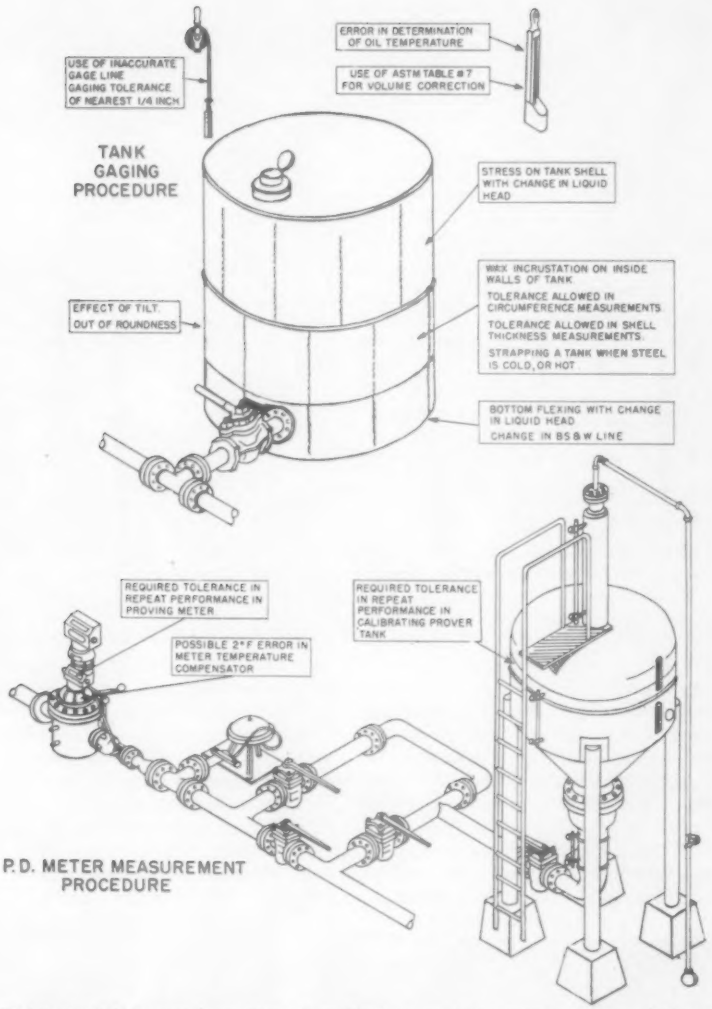
In the test runs, made at three different locations in all, accuracy of the meters versus hand gaging was effective within 0.15 per cent. Prover tanks, meanwhile, have checked out with a comparison between runs of 0.0001, well within the tolerable limits of 0.0005.

Metering . . . Oil leaves the lease tank through a tank shutoff valve, passes through a strainer, and is picked up by a pump. It is then pumped through an air eliminator, through the vane-type displacement meter and into the gathering system. The meter is equipped with a temperature-compensating mechanism which corrects the quantity of oil from the flowing stream temperature to the standard 60° F. basis. The meter is also equipped with a ticket printer which prints the opening and closing meter readings, minimizing any errors in transmitting meter readings to run tickets by hand. Additional meter equipment includes a "quantity determining" device which may be preset by the gager to permit no more oil than the accrued allowable or the daily allow-

to pipeline. Which is why . . .

# of Approval

by Larry Resen
District Editor


USE OF INACCURATE GAGE LINE GAGING TOLERANCE OF NEAREST 1/4 INCH
ERROR IN DETERMINATION OF OIL TEMPERATURE
USE OF ASTM TABLE # 7 FOR VOLUME CORRECTION
TANK GAGING PROCEDURE
STRESS ON TANK SHELL WITH CHANGE IN LIQUID HEAD
WAX INCRUSTATION ON INSIDE WALLS OF TANK
TOLERANCE ALLOWED IN CIRCUMFERENCE MEASUREMENTS
TOLERANCE ALLOWED IN SHELL THICKNESS MEASUREMENTS
STRAPPING A TANK WHEN STEEL IS COLD, OR HOT
EFFECT OF TILT OUT OF ROUNDNESS
BOTTOM FLEXING WITH CHANGE IN LIQUID HEAD
CHANGE IN BS&W LINE
REQUIRED TOLERANCE IN REPEAT PERFORMANCE IN PROVING METER
REQUIRED TOLERANCE IN REPEAT PERFORMANCE IN CALIBRATING PROVER TANK
POSSIBLE 2°F ERROR IN METER TEMPERATURE COMPENSATOR
P.D. METER MEASUREMENT PROCEDURE

HAND-GAGING procedures shown here illustrate possible sources of error which tip scales in favor of p.d. meters. Fig. 1.

able to move through the meter during a given period.

The metered oil passes through a continuous sampling device which accumulates a sample representative of the metered stream. From this sample the gager can determine the gravity and b.s. and w. content of the oil being run.

Prover tanks . . . Prover tanks are used to check the accuracy of each meter and to provide a compensating factor to be applied as the meter's parts gradually wear down. The tanks also provide a means of predicting when a meter may need repairs, for as the factor increases, the likelihood that some parts need to be replaced also increases. At the Anahuac location, prover tanks are used at each meter run. At another field test site, Conroe, Humble is using a master meter to check the meter runs, and then calibrating the master meter at a prover tank in a central location.

The prover tanks are equipped with "seraphin" necks at the top and bottom. As the liquid level passes calibration marks at the necks, opening and closing gages are taken and the reading obtained checked against the meter on the line. The narrow diameter of the necks provides a fine degree of accuracy. Permanent angle-stem thermometers in the tank show average temperature of the oil when it is gaged.

The tank also has a cone bottom to reduce sediment on the bottom of the tank. Most of the tanks are equipped to permit inspection of the inside surface. While stock tanks were subject to encrustation, periodic inspection of the prover tank at Anahuac showed no such encrustation. The oil never stands in the tank more than a few minutes at a time, and hence there is no time for deposits to build up on the inside surfaces.

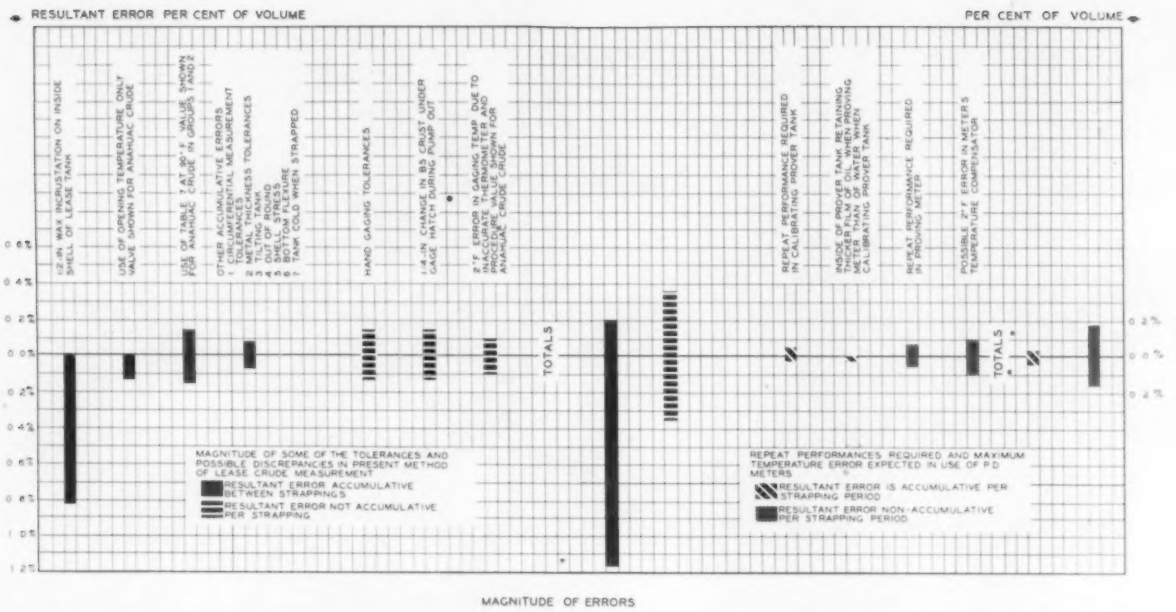
If the meter measurement varies from the prover tank measurement, a "meter factor" is determined and shown on each ticket covering later volumes measured by the meter. This factor is used on each ticket until the meter is proved again into the prover tank. Calibration of the prover tank and all meter provings are witnessed by both producer and carrier and official records are kept on these operations. By this means, the volume of oil run out of the lease tank is, in effect, based on a measuring tank since the proving tank is used to determine meter factor.

Gaging errors . . . There are a number of possible sources of error when gaging lease tanks (Fig. 1):

1. Encrustation on inside walls of the tank.

2. Permissible tolerance in gaging the height of oil by measuring to the nearest ¼ in.

3. Changes in thickness of b.s. and w.


RESULTANT ERROR PER CENT OF VOLUME
PER CENT OF VOLUME
1/2 IN. WAX INCRUSTATION ON INSIDE SHELL OF LEASE TANK
USE OF OPENING TEMPERATURE ONLY VALVE SHOWN FOR ANAHUAC CRUDE
USE OF TABLE 7 AT 80° F. VALUE SHOWN FOR ANAHUAC CRUDE IN GROUPS 1 AND 2
OTHER ACCUMULATIVE ERRORS
1 CIRCUMFERENTIAL MEASUREMENT
2 METAL THICKNESS TOLERANCES
3 TILTING TANK
4 OUT OF ROUND
5 SHELL STRESS
6 BOTTOM FLEXURE
7 TANK COLD WHEN STRAPPED
HAND GAGING TOLERANCES
1/4 IN. CHANGE IN BS CRUST UNDER GAGE HATCH DURING PUMP OUT
2° F. ERROR IN GAGING TEMP. DUE TO INACCURATE THERMOMETER AND IMPROPER IMMERSION FOR ANAHUAC CRUDE CRUDE
TOTALS
REPEAT PERFORMANCE REQUIRED IN CALIBRATING PROVER TANK
INSIDE OF PROVER TANK RETAINING THICKER FILM OF OIL WHEN PROVING WITH WATER THAN WHEN CALIBRATING PROVER TANK
REPEAT PERFORMANCE REQUIRED IN PROVING METER
POSSIBLE 2° F. ERROR IN METER'S TEMPERATURE COMPENSATOR
TOTALS
0.6%
0.4%
0.2%
0.0%
0.2%
0.4%
0.6%
0.8%
1.0%
1.2%
0.2%
0.0%
0.2%
MAGNITUDE OF SOME OF THE TOLERANCES AND POSSIBLE DISCREPANCIES IN PRESENT METHOD OF LEASE CRUDE MEASUREMENT
RESULTANT ERROR ACCUMULATIVE BETWEEN STRAPPINGS
RESULTANT ERROR NOT ACCUMULATIVE PER STRAPPING
REPEAT PERFORMANCES REQUIRED AND MAXIMUM TEMPERATURE ERROR EXPECTED IN USE OF P.D. METERS
RESULTANT ERROR IS ACCUMULATIVE PER STRAPPING PERIOD
RESULTANT ERROR NON-ACCUMULATIVE PER STRAPPING PERIOD
MAGNITUDE OF ERRORS

THE MAGNITUDE OF ERRORS of conventional and meter measurement charted here points up advantages of meters. **Fig. 2.**

under the gage hatch due to shifting between opening and closing gages.

4. Possible errors in determining average temperature of oil when gaged.

5. Use of abridged A.S.T.M. Table 7 for correcting the volume of oil to 60°.

6. Others less significant:

(a) Permissible tolerance in circumference measurements when tank strapping.

(b) Possible errors due to temperature of steel when taking circumference measurements.

(c) Permissible tolerance in measurement of thickness of the metal or wood in tank shell.

(d) Errors due to tank-bottom flexure between opening and closing gage.

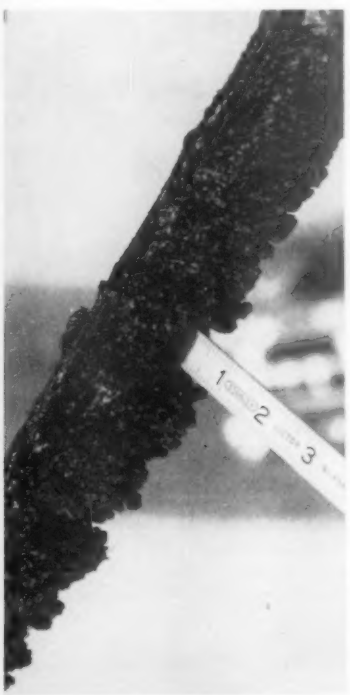
(e) Variation in stress on tank shell due to changes in liquid head.

(f) Effect of tilt and effect of "out-of-roundness."

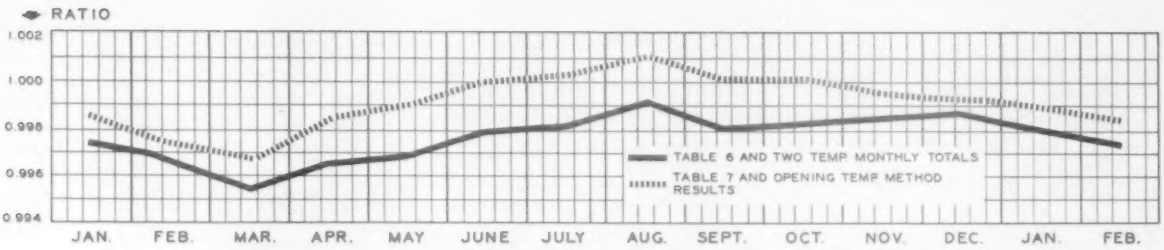
Total cumulative errors by conventional measurement may amount to as much as 1.0 per cent minus or 0.15 per cent plus. The noncumulative errors

PARAFFIN encrustation is shown on shell removed from Anahuac tank. **Fig. 3.**

CLOSEUP of tank shell shows paraffin ½ in. thick. **Fig. 4.**



ENCRUSTATION on this roof support is up to 1 in. thick. **Fig. 5.**



RATIO OF METER results to hand-gage results using both A.S.T.M. Tables 6 and 7. Fig. 6.

may be around 0.35 per cent plus or minus. These are charted in Fig. 2. They do not include errors due to such items as failure of equipment. For instance, failure of production equipment might result in a well pumping into a tank as it was being emptied.

Encrustation . . . One of the biggest potential sources of error is encrustation on the walls of a tank.

The deposits on the inside walls of a tank can consist of paraffin, wax, and corrosion products. This occurs without any uniformity, hence one portion of the tank may be heavily encrusted and the other perfectly clean. This makes it impossible to figure the exact internal volume of a tank. Periodic cleaning is only of partial benefit since encrustation is a continuing process. A hand-gaged measurement has a cumulative error of about 0.8 per cent when the tank wall is encrusted to a depth of ½-in. and the tank table calculated for a clean tank.

The encrustation will vary both in its thickness and the amount of internal surface it covers. In Fig. 3 is seen a portion of a tank shell removed from a tank in Anahuac field. More than 50 per cent of the entire sheet was encrusted with paraffin more than ½ in. thick (see closeup, Fig. 4). A roof support from a tank in the same field (Fig. 5) shows encrustation ½-1 in. thick.

During the early part of the program, discrepancies in measurement made by the meter and hand-gaging procedure were noted at two locations. These were not the result of incorrect application of either the meter or the hand-gaging procedure. At Anahuac, wax accumulation on the inside walls of the lease tanks caused the gager's measurement to indicate more oil than would actually move out of the tank and as was measured by the calibrated meter.

At another location, failure of producer's equipment permitted more oil to move into the pipeline than was indicated by gaging. When the production equipment was corrected excellent agreement was secured between the metered and hand-gaged volume. The wax-encrusted tank battery was thoroughly cleaned, after which the meter measurement checked very closely with the gaged volume. However, wax has since accumulated to the point that the meter shows less oil moving from the battery than by hand-gaging measurements.

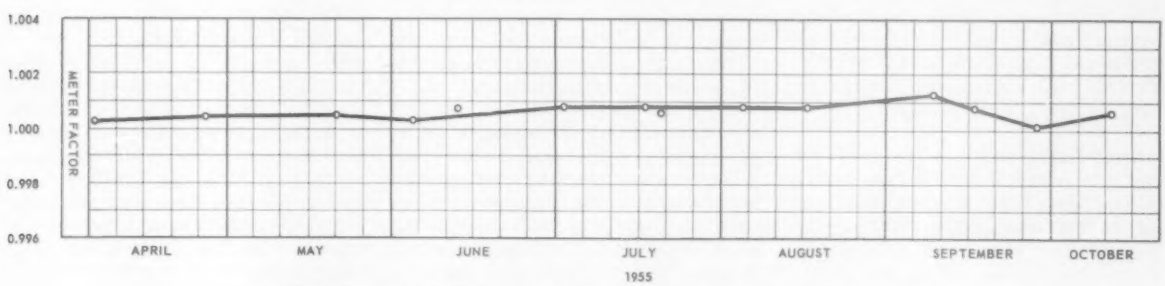
Experimental runs showed that occasionally the b.s. and w. content determined by the gager's thief sample would be higher than that obtained by the continuous sampler on the meter run. This was because as the oil was moving out of the tank some of the suspended b.s. and w. settled out in the bottom of the tank and didn't enter the pipeline. Experience further showed that producer's equipment could fail in such a way that oil could flow into the tank that was opened to the pipeline and not be caught by conventional methods, although the meter would record such flow faithfully.

Case for meters . . . In Fig. 6 is seen a comparative ratio of metered volumes to hand-gaged volumes made during part of Humble's experimental work. The horizontal coordinates represent time (months); vertical coordinates are ratios of the monthly metered volumes divided by the hand-gaged volumes. One of the curves is computed for the hand-gaged volumes corrected to 60° F. by using A.S.T.M. Table 6 and opening and closing temperatures. In the other curve the volumes are corrected to 60° F. using A.S.T.M. Table 7 (abridged table) with the opening temperature only. These curves, Humble feels, make a good case in favor of meter measurement. The meter results in a more consistent approximation of "true" volumes than does the conventional procedure.

In Fig. 6, the monthly metered volumes are assumed as a "standard." This was done because the metering procedure is affected by fewer extraneous and uncontrollable factors (the human element, geometry of the lease tank, positive shutoff of interconnecting valves, etc.) than is hand gaging. These monthly standards were divided by the monthly hand-gaged volumes to derive ratios of agreement.

The ratios were then plotted above or below a unity line that would indicate perfect agreement between the two procedures. If portions of the resulting curve fall along the unity line, and their deviations from this line can be shown to result from known inaccuracies in the hand-gaging procedure, then the assumption of the metered volumes as standard is validated.

Deviations . . . Consider first the curve for hand-gaged volume, computed from A.S.T.M. Table 6. Its ratio of agreement with the metered volume in January 1955, was about 0.9985. The deviation shown on this curve increased to a maximum in March when its ratio of agreement was about 0.9968. From that point, its deviations decreased un-



CONSISTENCY OF METER factor is illustrated by this 6-month record. Fig. 7.

HUMBLE PIPE LINE COMPANY

POSITIVE DISPLACEMENT METER PROVING REPORT

TYPE OF LIQUID: Crude Oil	LOCATION: Anahuac - A. D. Middleton	DATE: 10-18-55	REPORT NUMBER: 22
MAKE OF METER: Smith	MODEL: W-12	TEMPERATURE COMPENSATED: [ ] NO [x] YES — GROUP NO 2 1/2 GRAVITY 35	REGISTER NO: 33993

METHOD OF PROVING: [x] PROVER TANK [ ] MASTER METER

SIZE	REGISTER NO	PRESSURE ON PROVER TANK				
24 Bbls.		Atmospheric				
MAKE	REGISTER NO	SIZE	PREVIOUS PROVING DATA	DATE	TYPE OF LIQUID	FACTOR

PROVER TANK OR MASTER METER DATA	RUN NO 1	RUN NO 2	RUN NO 3	RUN NO	RUN NO
TIME OF DAY	9:30 a. m.	10:30 a. m.	11:30 a. m.		
DURATION OF RUN	20	20	20		
GRAVITY OF LIQUID API @ 60° F	35°	35°	35°		
PROVER TANK TEMPERATURE °F	78 78 78	78 78 78	78 78 78		
AVERAGE PROVER TANK TEMP °F	78	78	78		
CLOSING READING IN BARRELS	23.597	23.552	23.590		
OPENING READING IN BARRELS	-0.135	-0.162	-0.122		
GROSS BARRELS MEASURED	23.732	23.714	23.712		
TEMP. CORR. FACTOR FOR TANK SHELL	1.0003510	1.0003510	1.0003510		
TEMP. CORR. FACTOR FOR LIQUID	0.9920	0.9920	0.9920		
COMB. LIQUID & SHELL CORR. FACTOR	-	-	-		
MASTER METER FACTOR	-	-	-		
NET BARRELS MEASURED	23.550	23.532	23.530		
DATA ON METER CHECKED					
METER CASE PRESSURE	17#	17#	17#		
RATE OF FLOW (B/H)	90	90	90		
TEMPERATURE OF METERED STREAM °F	78	78	78		
CLOSING METER READING IN BARRELS	139.937	175.256	214.679		
OPENING METER READING IN BARRELS	116.358	151.701	191.123		
GROSS BARRELS METERED	23.579	23.555	23.556		
TEMPERATURE CORRECTION FACTOR					
NET BARRELS METERED	23.579	23.555	23.556		
METER FACTOR	0.99880	0.99902	0.99890		

TOTALIZER READING	767,346.0	AVERAGE METER FACTOR	0.99896
BARRELS METERED SINCE LAST RUN	11,854.0	METER FACTOR TO BE USED	0.9990

CALIBRATOR ADJUSTMENT: [ ] NO [ ] YES — AMOUNT _____ RETARDED _____ ADVANCED _____

REMARKS (REPAIRS, ETC.): _____

SIGNED BY	SIGNED BY	CALCULATIONS VERIFIED BY
J. R. McGee		jl
FOR: HPL Company	FOR:	SHEET NUMBER

TYPICAL meter-proving report by Humble. Fig. 8.

til virtual agreement with the metered volume was reached in June 1955. This minimum deviation, except for a fluctuation in August, continued until October 1955, after which the deviation began to increase until February 1956 when it approximated the same value as for January 1955.

The increasing deviations during January, February, and March 1955 were found to result from an increasing build-up of paraffin on the inside walls of the lease tanks. When the tanks were cleaned in May, the hand-gaged volume began to approach the metered volume. The improvement was actually even greater than shown by the curve because the volume shown for May included some measurements made before the tanks were cleaned.

August fluctuation . . . A study was made to determine the cause of the August deviation. It was found that all of the discrepancies between the metered and hand-gaged volumes occurred in runs from two tanks of the seven-tank battery. Five of these tanks are installed on one side of a common tank header. Hand-gaged volumes from these tanks had a ratio of agreement with the meter of better than 1.0002 during the 5 months from June through October 1955.

The two tanks which accounted for the error are adjacent to each other. These are on the other side of the tank header from the five tanks from which the runs were in agreement. There appears to be some abnormal condition in a phase of the hand-gaging system on these two tanks that consistently produced erroneous measurements from these two tanks during the month of August. It has been impossible to determine precisely what has caused this inconsistency in measurements.

From experience with encrustation of paraffin during the winter of 1954-55, the deviations could be expected to increase during cooler weather. The curve confirms this. Inspection of the tanks in February 1956 showed the beginning of a paraffin encrustation that accounts for the downward trend in the curve from October. The curve computed by the use of Table 7 follows the same trend as that for Table 6, with wider discrepancies from the "standard volumes." It is interesting to note the variable differences between the two curves, due to the fact that inaccuracy from the use of Table 7 with respect to Table 6 increases with the temperature and can be expected, as indicated, to be greater during the summer months.

Temperature influence . . . In comparing A.S.T.M. Table 6, with its abridgment, Table 7, it may be observed that as temperatures increase appreciably above 60° F., the deviation between the volume-correction factors for a given gravity widens considerably. This discrepancy is due primarily to the abridgment, in which the same factor is used for a group of varying gravity oils.

As an example, Group 1 covers 15.0° to 34.9° A.P.I. gravity and Group 2 covers 35.0° to 50.9° A.P.I. gravity. Anahuac crude is approximately 35.0° A.P.I. At 90° F., the factor shown in Table 6 for 35.0° gravity is 0.9866, while the factor shown in Group 2 of Table 7 is 0.9851. This is because the factor shown in the abridged table is an average factor for the midpoint between 35.0° and 50.9°, or 44.0° A.P.I. The use of Table 7 is not an error of the hand-gaging procedure, per se, but its use is universal in the pipeline industry.

In the meter-measurement procedure the temperature compensator on the meter may be made to correct the oil to 60° F. on the basis of the oil's actual gravity. This in effect, is correcting it on the basis of the full Table 6.

Volume measurement . . . All oil run from Humble's three test projects was measured by the gager's conventional procedure and reported on the regular run ticket as the official measurement. The run tickets were then recalculated, using the most accurate means available to correct the oil to 60° F. in order that the volume could be compared to the volume indicated by the temperature compensated meter. A typical weekly data sheet showing the daily runs measured by the two procedures is seen in Table 1.

A tabulation of the volume of oil run from the batteries on the Anahuac lease for a period of 1 year is shown in Table 2. It may be seen from the data that during the first 6 months the meter method shows 0.185 per cent less oil run than did the conventional gaging procedure because of wax encrustation on the inside walls of the lease tanks. The wax was removed after which the last 6 months' total

TABLE 1—OIL-MEASUREMENT TESTS—ANAHUAC

		From pipeline gager								From pipeline meter (factor = 1.0003)				
		1st gage		2nd gage		Temp., °F.	B.s.&w.	Gravity at 7′		Meter	Bbl.	B.s. & w.	Gravity at	Net
Date	Tank No.	Feet	Inches	Feet	Inches	6′6″	% at 7′	at temp., °F.	Net bbl.	reading	at 60° F.	(%)	temp., °F.	bbl.
9	79589	14	10	4	4½	80	0.2	36.0 at 80	653.18					
9	59743	14	5¾	4	4½	83	0.2	36.1 at 82	648.24	1,301.3	1,301.7	0.2	36.3 at 81	1,299.1
									1,301.42					
10	79588	14	7¾	1	7¼	86	0.2	36.4 at 84	836.83					
10	62056	14	7½	1	7	87	0.2	36.5 at 85	811.45	1,649.8	1,650.3	0.2	36.4 at 85	1,647.0
									1,648.28					
11	79590	16	1	1	7½	90	0.2	36.6 at 87	926.11					
11	59743	15	8¼	1	7¼	84	0.2	36.3 at 82	903.25	1,832.3	*1,833.2	0.2	36.3 at 81	1,829.5
									1,829.36					
12	79589	15	9¾	1	6	88	0.2	36.4 at 86	891.11					
12	79602	16	1	1	6½	95	0.2	36.6 at 92	928.50	1,823.2	1,824.1	0.2	35.5 at 72	1,820.5
									1,819.61					
13	79588	14	9	1	6¾	93	0.2	36.8 at 93	843.79					
13	62056	15	0	1	6¼	87	0.2	36.5 at 86	838.66	1,684.2	1,685.0	0.2	35.5 at 68	1,681.6
									1,682.45					
14	79590	14	3½	1	7¼	87	0.2	36.5 at 86	813.72					
14	79602	14	3¾	1	7½	82	0.2	36.3 at 81	814.43	1,630.5	1,631.3	0.2	35.8 at 74	1,628.0
									1,628.15					
15	79589	14	8¾	1	7¼	82	0.2	36.1 at 80	819.19					
15	59743	14	9½	1	7¼	84	0.2	36.3 at 82	845.83	1,664.8	1,665.6	0.2	35.9 at 75	1,662.3
									1,665.02					
Weekly total									11,574.29					11,568.0

*Factor = 1.0005.

TABLE 2—HAND-GAGED AND METERED VOLUMES

Anahuac installation—	Comparison before wax was removed	Comparison after wax was removed	Comparison entire period
Period covered	11-20-54 to 5-20-55	5-20-55 to 11-26-55	11-20-54 to 11-26-55
Total barrels measured:			
By gaging procedure	323,411.24	305,612.78	629,024.02
By p.d. meter	322,811.17	305,640.80	628,451.97
Difference, bbl.	—600.07	+28.02	—527.05
Difference, per cent	—0.185	+0.009	—0.09

TABLE 3

Total all installations—	Including period when wax encrustation existed	Excluding period when wax encrustation existed
Total net barrels measured:		
By gaging procedure	1,227,873.45	904,462.21
By p.d. meter	1,227,416.35	904,605.18
Difference, bbl.	457.10	142.97
Difference, per cent	0.037	0.015

shows the meter volume to agree with the gaged volume to within 0.009 per cent. This proves rather conclusively that where encrustation exists, the conventional method of measuring will produce erroneous results.

Table 3 is a tabulation of the total of 1,227,416 bbl. of oil run from the three leases, measured by both procedures. In the total, which includes the period when wax encrustation existed, the comparison of the two methods agrees within 0.015 per cent.

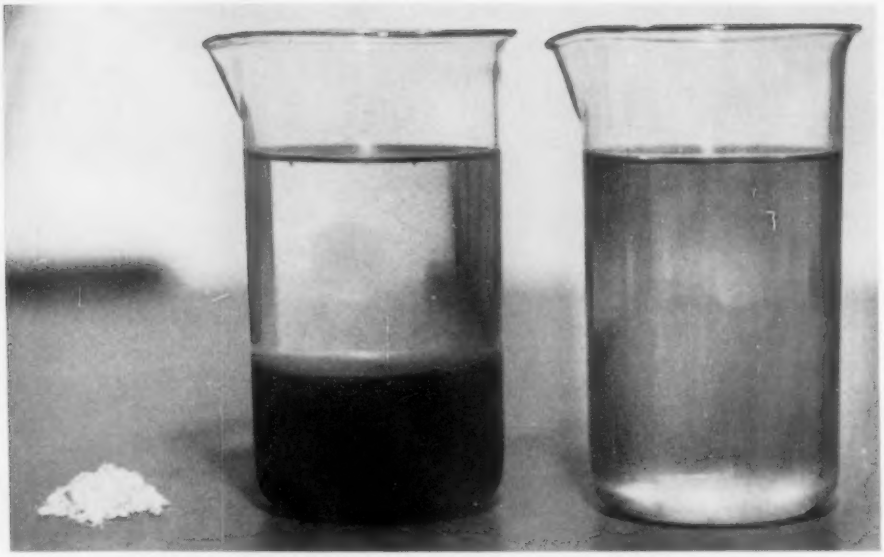
The consistency of the meter factor over a 6-month period is shown in Fig. 7, which presents a graph on the same scale as Fig. 2. As was noted, this factor is applied to the metered volume to correct it for slight variables in the measurement procedure. This graph points out the consistency of the meter factor. Such a record will indicate the condition of the meter and provide, in effect, advance notice of potential meter trouble, thereby practically eliminating failure of the meter.

Meter proving . . . A typical meter-proving report is shown in Fig. 8. Three separate meter-proving runs were made on the Anahuac location. Normally the first run is not considered an official run, but is made to establish equilibrium temperature conditions, wet the inside of the prover tank, and eliminate air from the tank. It is followed by run No. 2 from which the meter factor is calculated and then run No. 3 used as a check.

It is required that two such runs be made, or sufficient runs made so that two runs agree within 0.0005. The two runs are then averaged to establish the current factor for the meter being proved. From Fig. 8 it will be seen that the No. 2 and No. 3 runs agreed within 0.0001, well within the requirement. The average of the two runs is determined, rounded off to four decimals, and shown on each meter-proving date. The frequency of meter proving depends on a number of factors, but Humble's experience to date indicates that meter in such service should be proved at least once per month.

Acknowledgments

This material was developed from a report prepared under the supervision of Larry Wrightsman. Cooperation of the management of Humble Pipe Line Co. in the release of this material and Wrightsman's assistance is gratefully acknowledged.



THE TWO BEAKERS contain hydrochloric acid (left) and stabilized acid (right). Each has had the amount of iron carbonate shown in the pile dissolved in it, and then been spent to a pH of 4.5. The voluminous iron hydroxide precipitate may be seen in the beaker of unmodified hydrochloric acid. Fig. 1.

R_x for ailing injection wells . . .

STABILIZED ACID

There is a better chance of maintaining water intake of injection wells when they're treated with this new acid.

by C. F. Parks and W. N. Helberg

MAINTENANCE of permeability in water-injection wells is important for both water flooding and brine disposal. This may mean restoring permeability from time to time by removing material deposited in the pores of the formation by the water. A new acid, which will remove most of these deposits and also prevent secondary deposition of byproducts of the acid reaction, offers one of the best means of conditioning injection wells.

Injected waters not chemically treated may contain corrosive gases, solids, and dissolved salts which later precipitate under bottom-hole conditions. In such instances, permeability and injection rates have been drastically lowered in a matter of months. With the advent of chemical treatment and filtering and skimming operations, the life of wells has been increased considerably, but not indefinitely.

Analysis of deposits from injection wells, as well as salt-water disposal wells, have indicated the presence of organic materials (paraffin, oil, and bacteria), silt, sand, carbonate and sulfate minerals, and various iron oxides and iron sulfides. These materials are certain to be found in those wells that are injecting untreated water.

In wells injecting treated water, several of the above materials may be absent. In most instances, a major portion of these deposits may be chemically dissolved and/or physically removed. Inhibited hydrochloric acid, containing surface-active agents and possibly hydrofluoric acid, has in many cases been successfully used for this purpose.

Secondary deposition . . . A serious drawback to the use of acid is that some of the dissolved deposits may precipitate if the acid is allowed to spend completely. Ferric iron and aluminum hydroxides will begin to precipitate in a bulky gelatinous form after the pH of the acid rises above 2.7.

Such precipitation can easily nullify any benefit received from an acidizing treatment. Another danger is that the iron and aluminum minerals may be dissolved from an area near the well bore and redeposited in gelatinous form in the formation further back from the well bore. Since such deposition occurs on a larger radial arc, well-injection rates may be increased, but perhaps only temporarily.

Precipitation of aluminum and ferric hydroxide can be prevented by use of a stabilized acid; that is, one containing a suitable complexing agent. Laboratory tests have shown that, for these hydroxides to precipitate in the presence of a stabilizing agent, the fluid must reach a pH of 7. Since hydrochloric acid normally does not spend above a pH of 5, and since most brines have a pH lower than 7, it is doubtful

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Special Producing Section

TABLE 1—EFFECT OF STABILIZED ACID TREATMENTS ON INJECTION WELLS

Well	Before treatment		One week after treatment		Later well performance		
	Input, b.p.d.	Pressure, psi.	Input, b.p.d.	Pressure, psi.	Days after treatment	Input, b.p.d.	Pressure, psi.
A	219	610	840	530	163	893	560
B*	128	660	892	510	121	335	700
C	126	660	1,060	200	116	1,172	350
D	19	660	1,025	400	116	1,044	425
E	101	600	984	600	96	921	500
F	376	600	671	600	84	352	560
G	86	800	568	800	49	525	800
H	80	825	185	875	49	100	875
I	930	600	925	425	38	978	350
Average	229.4	668.3	794.4	548.9	92.4	702.2	568.9

*Well treated with carbon tetrachloride before stabilized acid. All injection rates and volumes based on 3-day averages.

that precipitation would occur, even if the spent acid were not returned. Continued dilution of the spent acid by injected waters should not cause precipitation of the complexed salts.

Stabilizer action . . . The effectiveness of this stabilizing agent in preventing the precipitation of iron from spent acid is illustrated in Fig. 1. On the left side of the photograph is shown a small pile of iron carbonate. Similar quantities have been dissolved in the two beakers, the one on the left containing hydrochloric acid, and the one on the right containing hydrochloric acid, plus the stabilizing agent.

Both of the acid solutions were spent with calcium carbonate until their pH had been raised to 4.5. A voluminous precipitate of iron hydroxide was formed in the beaker containing unmodified hydrochloric acid. In the beaker on the right, containing acid with the complexing agent, no precipitation of iron hydroxide occurred. This picture was taken approximately 1 hour after the acids were spent.

Injection rates . . . Field results have shown that the use of a stabilized acid is of definite benefit. The initial injection rates of wells treated with stabilized acid are comparable to those treated with ordinary hydrochloric acid. However, it has been found that after a period of time (depending upon the treatment of the injected water) the wells treated with stabilized acid took injected water at a much higher rate, and usually at lower pressure.

A summary of the injection rates of a number of wells, before and after treatment with stabilized acid, is shown in Table 1. All of these injection wells are located in northeastern Oklahoma and are injecting into the Bartlesville sand formation. The flood water was produced from the Arbuckle formation and in some instances contained dissolved hydrogen sulfide. It may be seen that sustained improvements in injectivity resulted from these treatments.

Removing paraffin . . . Another improvement in acidizing injection wells has been the use of magnesium pellets in conjunction with the acid. The purpose of the pellets is to raise the temperature of the acid, thus allowing for melting of paraffin deposits in the flow channels, and for more rapid and complete dissolution of inorganic deposits. Although this method had not been completely evaluated, to date it appears most beneficial.

Other treating procedures currently undergoing evaluation include the use of very slow injection rates (a half barrel per minute) as compared with high injection rates; return of the acid water versus overflush of the spent acid into the formation; and finally, the use of short acid soaking times (2 hours) versus long soaking times (as long as 24 hours). With all of these treating procedures, the use of stabilized acid has proved beneficial.

While the use of a stabilized acid treatment should allow for greater injectivity over a longer period of time, the quality of the injected water will be the controlling factor. It follows that if the water is treated, and free of solids, retreatment might not be necessary for a year or longer. However, if untreated water is used, the injection rate might fall off in a matter of a few months. Thus, any comparative evaluation of acid treatments should be made between wells with similar injection water. **End.**

Refiners to Review Isomerization, Reforming, and Future Octanes

THE twenty-second midyear meeting of the Division of Refining, American Petroleum Institute, will air new developments in processing, corrosion, fuels, instrumentation, and air pollution. Meeting at the Sheraton Hotel, Philadelphia, May 13-16, refiners will participate in a program on 10 general subjects.

Isomerization, the newest technique for raising motor-fuel octanes, will gain much attention. Papers are scheduled on Standard Oil Co.'s (Ind.) Isomate process, Atlantic Refining Co.'s Pentafining, M. W. Kellogg Co.'s Iso-Kel, and Universal Oil Products Co.'s Penex. In addition, Houdry Process Corp. will discuss pentane in high-octane gasoline.

Two additional papers on reforming will round out the processing sessions. Houdry is presenting one on dehydrogenative reforming of low-boiling saturates, and Humble Oil & Refining Co. will report on platinum reforming on a commercial scale.

Of particular interest to many refiners will be a special evening session on the handling of kerosine, where a report on the static electricity hazards involved will be given by Cities Service Research & Development Co.

Tomorrow's octanes will be anticipated in a session on fuels. Problems in designing gasolines for modern engines will be outlined by Ethyl Corp. Du Pont Co. authors will discuss road octane numbers needed for cars of the future. A refiner's outlook on the future fuels situation will be given by Humble representatives.

Progress reports in the continuing efforts to control air pollution will comprise another session. Instruments, electrical equipment, analytical research, and training will constitute other session topics.

The 4-day meeting will be opened with a morning session on corrosion. Particular attention this year will be directed to the type of corrosion encountered in catalytic reforming. Papers on this subject will be given by representatives of Socony Mobil Oil Co., Inc.; Universal Oil Product Co.; Standard Oil Co. (Ind.) and Esso Research & Engineering Co. Corrosion in crude processing will be discussed by Ohio Oil Co. authors.

New fracture techniques make possible . . .

Custom-Designed Well Stimulation

Here is a procedure which insures fracturing of most of the perforations in a cased well. Better production increases are resulting because of it.

by R. W. Coburn

EXPERIMENTS based on injection rate and the use of ball sealers[1] during fracturing of wells have led to the development of engineered well completions. These techniques finally enable an operator to design well-stimulation treatments to fit each completion regardless of area, lithology, or thickness of zone.

Actual field tests on several wells in Oklahoma, Kansas, and West Texas have verified data from a recent article[2] which indicates that oil containing 2 lb. per gallon of sand can be pumped through a standard jet hole (⅜-in. o.d.) at the approximate maximum rate of 1.3 bbl. per minute per perforation.* (See Fig. 1). Further field tests indicate that lease crude (40° gravity) can be pumped through this same hole at approximately 1.5 bbl. per minute per perforation.

For simplicity the word "fracture" will be used throughout this article to denote any type of stimulation which requires the injection of fluid into the formation to attain the desired results.

Theoretically it is desirable to fracture through each and every casing perforation. At an injection rate of 1.3 bbl. per minute per perforation it is obvious that impossible injection rates would be required to fracture each hole —i.e., 100 holes would require 130 bbl. per minute to fracture all of the holes. However, by use of ball sealers or other blocking agents it is possible to separate the treatment into stages which can utilize reasonable injection rates.

The use of blocking agents was developed to create additional fractures throughout the producing interval and not concentrate the treatment in one permeable zone. The advent of ball sealers as a blocking agent has enabled operators not only to create new fractures but also to control, within reason, the number of fractures created, thereby increasing completion efficiency. (Ball sealers are hard rubber balls slightly larger than perforations. They are injected with fracturing fluid and block perforations taking fluid).

Engineered well completions can be designed by use of the following procedure:

1. Determine best injection rate

Rate selection is of the utmost importance. The highest possible injection rate should be the most efficient. However, the best injection rate to select is that rate which the equipment on hand can maintain while pumping at the maximum expected pressure. The successful use of ball sealers creates higher pressures after each application and, consequently, if maximum possible rates are used at the start it will be impossible to continue the rate in the face of continuous pressure buildup. A good example of the pressure increase versus rate decrease is shown on Fig. 2, a plot of actual well conditions.

2. Select number of stages

A simple formula can be used to determine the number of stages required to assure that each perforation is fractured.

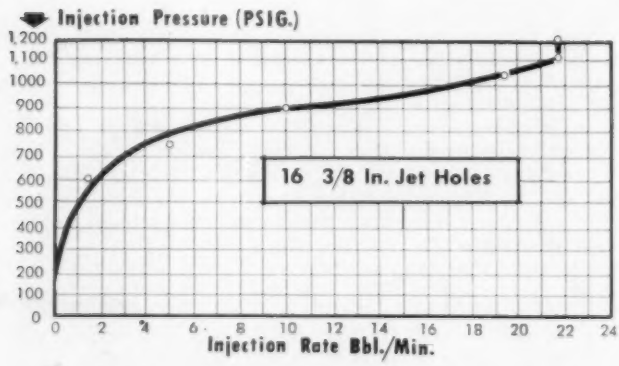
$$\text{Number of stages} = \frac{\text{1.3 bbl. per min.} \times \text{No. } \frac{3}{8}\text{-in. jet holes}}{\text{Injection rate to be used}}$$

The controllable items in this formula are number of holes and injection rate. These values should be selected to result in the use of the least

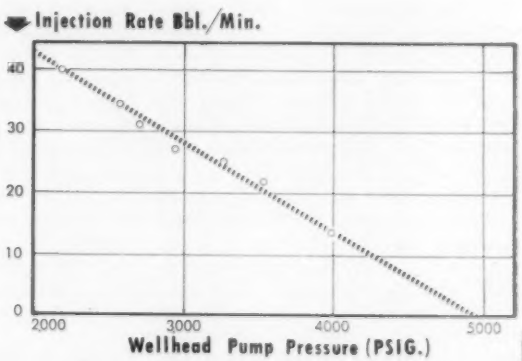
*Ed. note: Flow rate through a perforation is theoretically proportional to the square root of the pressure drop across it. The flow rate of 1.3 bbl. per minute through ⅜-in. perforation requires a pressure drop of about 200 to 300 psi. as shown in Reference 1. This range of difference between well-bore pressure and pressure within a perforation being fractured is coincidently about what is obtained during the process of successively fracturing all perforations.

Author is district superintendent, Champlin Oil & Refining Co., Enid, Okla.

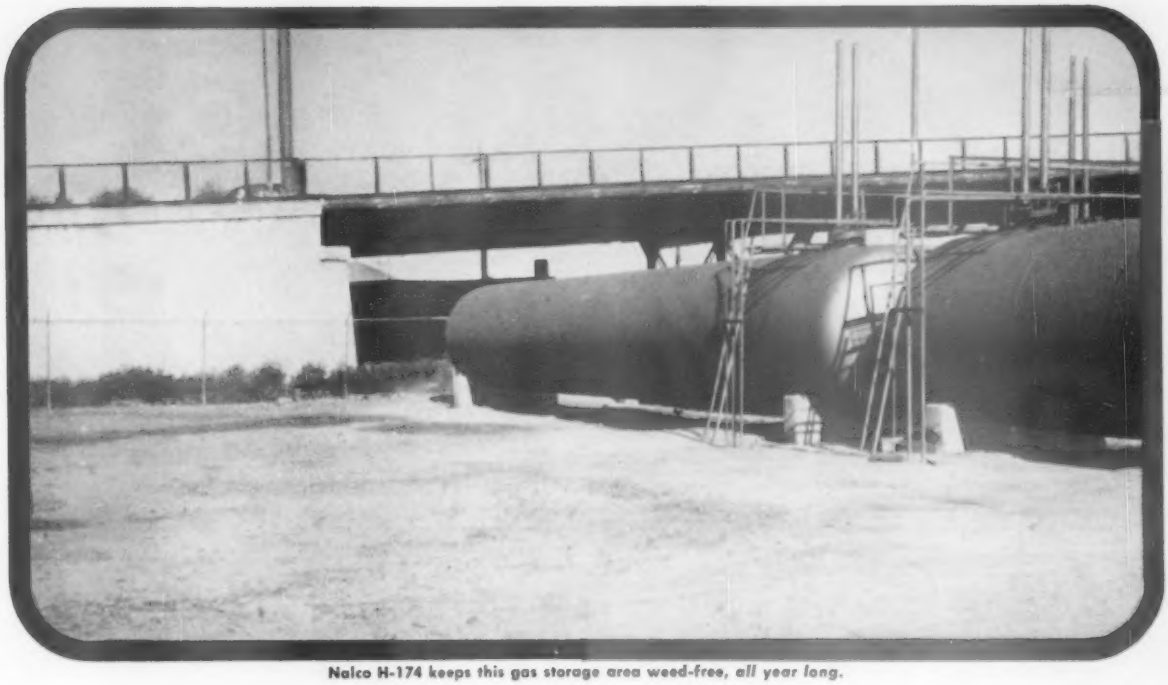
Special Producing Section



EFFECT of number of perforations on injection rate. Fig. 1.



EFFECT of pressure on injection rate. Fig. 2.



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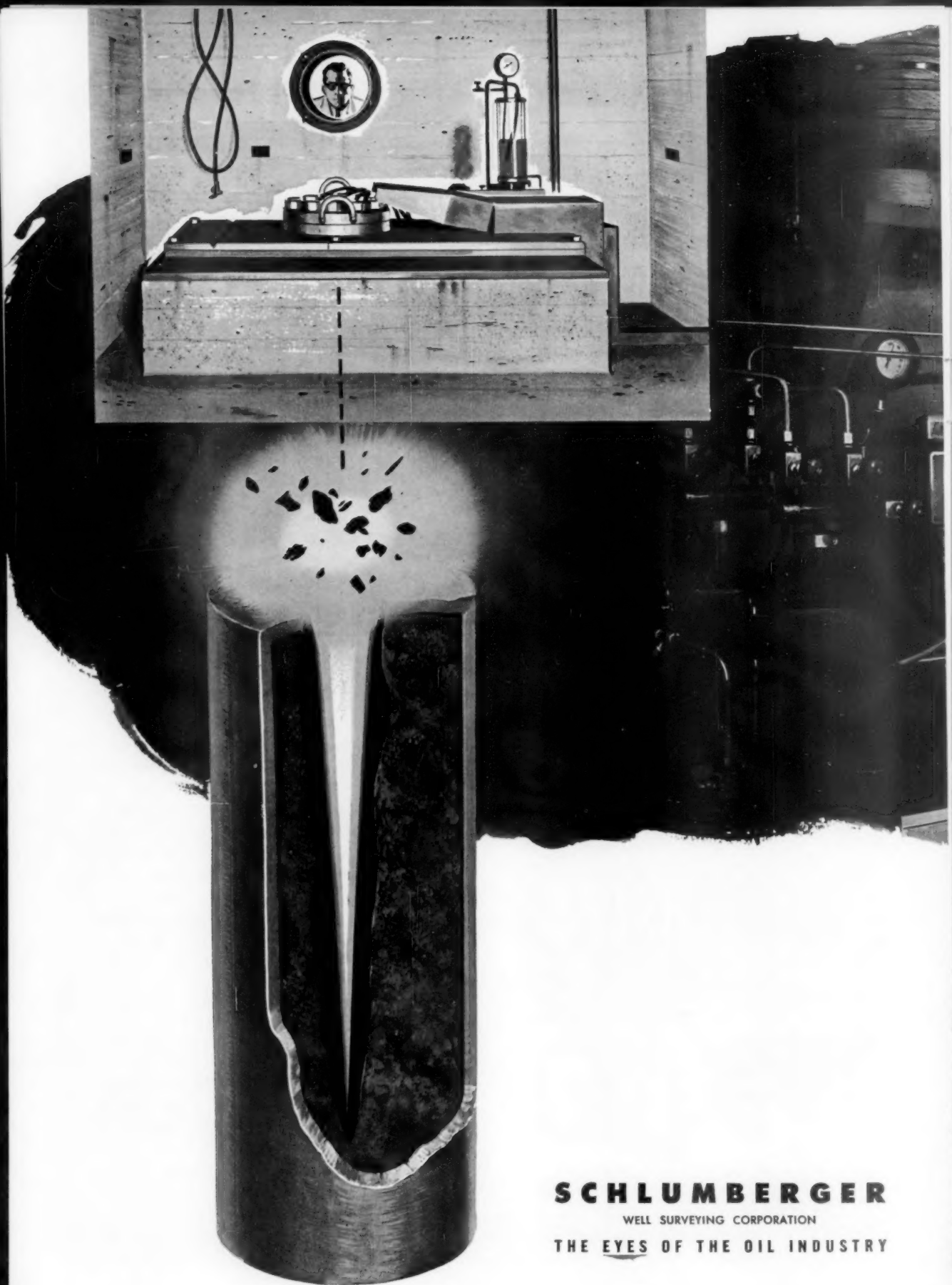

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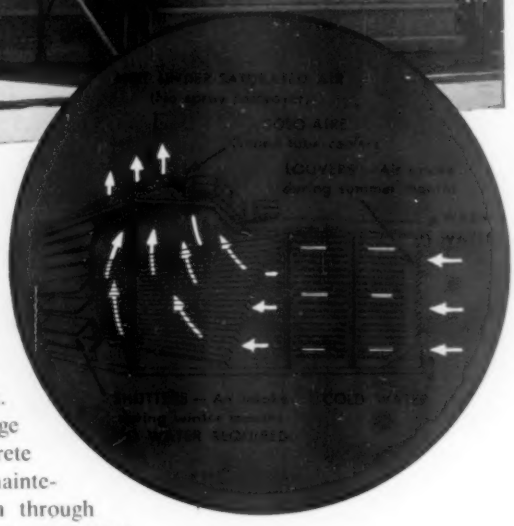

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number of stages. The fewer the stages required the simpler the job. Less flush oil and blocking agents are required resulting in less cost per job.

3. Select type, quantity and size of blocking agent

There are many blocking agents available. Among them are moth balls, chemical gels, lost-circulation material and the recent addition, ball sealers. Field tests performed in developing this technique used ball sealers. Ball sealers are recommended for several reasons: (a) a definite number of holes are to be plugged at each stage and balls can be counted and injected with reasonable accuracy; (b) the balls will not pump through the holes at reasonable temperatures and pressures; (c) the balls will not break down as will some of the other blocking agents; and (d) the quantities of other blocking agents cannot be calculated on a quantity per hole basis at this time. If ball sealers are used it is important to select the proper diameter ball to seal various sized holes created by different types of guns.

To select the number of balls to be used per stage, divide the intended injection rate by 1.3. Experience indicates that a loss in sealing efficiency occurs at the perforations. That is to say each of the balls injected does not seal a hole. Therefore, ball requirements are increased arbitrarily by 20 per cent. The surface injection equipment should be rigged to permit an accurate accounting of balls before and after each job.

In injecting ball sealers it is good operating practice to make sure that there is no sand-laden fluid in the system at the time the balls are due to seal. A sharp pressure change or loss in velocity could cause a sandout.

4. Select volume of fluid and sand

Insofar as this technique is concerned volume is not critical and will not affect the mechanics of the job. The selection of the volume of fracture fluid to be used is dependent on the desires of the operators which in turn depend on zone thickness, purpose of treatment and results desired. However, a basic change in thinking is required. Formerly, volumes were considered on a gallon per foot basis; now with each hole a target for fracture a new value needs to be considered, i.e., gallons per perforation.

Sand volume is not considered critical. One pound per gallon is considered satisfactory in most cases. Here again the operator can select the sand content desired without any effect on the efficiency of the technique outlined.

Here is an example of a well-treatment design.

Number of feet perforated	102
Number of perforations	204
Maximum injection rate at maximum pressure, bbl. per minute (down casing)	41.5
Number of stages (1.3×204)/40 bbl. per minute	6.6 or 7
Number of balls, (40/1.3) 1.20	36
Volume fracture fluid, gal. (6,000 gal. per stage)	42,000
Volume per hole, gal.	206
Amount of sand, lb. per gal.	1

The job prognosis was written as follows: Fracture down the casing with seven stages of 6,000 gal. and 6,000 lb. sand. Each stage to be flushed with 25 bbl. lease crude, 36 ball sealers, and 75 bbl. of lease crude. An injection rate of 40 bbl. per minute is to be maintained.

Re-treating wells . . . New completions are not too complicated, but what about old wells which have been fracture treated one or more times? Analyzing past fracture treatments in the light of these newly developed techniques indicates that fracturing efficiency has averaged less than 10 per cent. This means that fewer than 10 holes out of each 100 perforations were actually treated. (Table 1 shows typical fracturing efficiency.)

TABLE 1—TYPICAL FRACTURING EFFICIENCY

Well No.	Total holes perf.	Injection rate (BPM)	Est. No. of holes treated	Est. per cent of zone treated
1	72	4.5	4	6
2	28	2.2	2	7
3	108	5	4	4
4	36	3.4	3	8

In a great many cases remedial work is not being considered because the initial fracture treatment was not overly successful. If commercial wells can be made with fracturing efficiency of less than 10 per cent, there is then a fertile field for ball-sealer techniques with efficiencies which approach 100 per cent. This technique is particularly attractive where extensive zones were perforated and fractured with low injection rates.

The procedure developed to refracture old wells is essentially similar to that described for new wells. It is necessary to have the treating record of previous treatments before designing the job. If these records are available, proceed as follows:

1. Record number of ⅜-in. jet holes open.

2. From treating record—note injection rate on previous jobs.

3. Divide original injection rate by 1.3 to give number of holes originally fractured.

4. Inject enough balls to seal holes previously fractured using the same injection rate as was used originally and adding 20 per cent extra balls to account for the loss in sealing efficiency.

5. Determine number of holes still open.

6. Determine maximum possible injection rate at maximum expected pressure.

7. Determine number of stages required.

8. Determine number of ball sealers required.

9. Set up and perform job in the same manner as for a new well. The critical point is to seal the original holes by using the same injection rate as was used originally. Once these balls are in place the job is brand new.

A sample calculation of a refracture job is shown below:

Original fracture job . . . Sixty ⅜-in. jet holes were fracture treated with 4,000 gal. and 4,000 lb. of sand with an injection rate of 3.7 bbl. per minute. Fracture efficiency, 5 per cent.

Problem . . . To refracture and increase production.

Number of holes originally fractured	3
Number of holes unfractured	57
Maximum injection rate selected, bbl. per minute (down annular space)	15
Number of stages required (1.3×57)/15	7.4 or 8
Number of ball sealers (15/1.3) 1.2	13
Volume of fluid, gal. (eight 1,000-gal. stages)	8,000

The job would be performed as follows: Four balls would be pumped in at a rate of 3.7 bbl. per minute. When the balls are in place the remaining holes would be fracture treated at 15 bbl. per minute using eight stages of 1,000 gal. fluid, 1,000 lb. sand and 13 balls between stages.

The above calculations are based on the passage of fluid through a standard ⅜-in. jet hole. However, the procedures recommended can be used with any size perforated hole. It would be necessary only to determine the maximum possible injection rate through each hole and to substitute this value for 1.3 in the formulas shown. There are variations of this technique which operators can select as experience is gained in selected areas.

The techniques developed in the article have been field tested in part and in total on wells in the Mid-Continent area. Results to date indicate that wells treated with ball sealers in the manner described have proved to be better wells than those treated in the conventional manner. Continued observation of these wells plus continued refinement of stimulation techniques will lead to low-cost, high-potential completions.

References

1. "Rubber Balls New Aid in Big Frac Jobs," The Oil and Gas Journal, September 10, 1956, p. 86.

2. Stekoll, Marion, "Fracturing Through Perforations," The Oil and Gas Journal, October 29, 1956.

Table 1—How 18 Companies Handle Corrosion Problems

Refinery	Primary responsibility	Assisting groups	Corrosion committee	Remarks
1	Inspection department and metallurgist	Engineering, research, maintenance.	No	Laboratory or field tests as required.
2	Inspection department.	Process and maintenance engineering.	No	Corrosion engineers in central offices coordinate data and inform refineries.
3	Corrosion engineer.	Engineering, metallurgical, process and maintenance engineers, research and development department.	No	Have good cooperation of all groups.
4	Inspection department.	Mechanical and research departments.	No	Mechanical section coordinates and distributes information to refineries.
5	Process division.	Inspection and materials and standards groups.	No	Inspection group determines problems.
6	Local engineering department.	Operating, metallurgical and laboratory groups.	No	Central engineering department assists if local engineering requires.
7	Manufacturing department, inspection division	Corrosion groups of engineering and construction, research and development.	Yes	Bimonthly meetings, laboratory and field tests.
8	Refinery management and inspection department.	Corrosion engineer.	No	Corrosion engineer makes tests. Other refineries kept advised.
9	.....	One man working on corrosion.	No	Disbanded corrosion group in 1954.
10	Inspection department.	Engineering, research, metallurgist.	Yes	Good organization with management support.
11	Inspection department.	Refinery engineer, laboratory department, process department.	No	Two engineers assigned chiefly to corrosion control.
12	Inspection department.	Laboratory.	No	.....
13	Refinery tech. department.	Research and development department.	No	Corrosion engineers conduct tests.
14	Refinery corrosion engineer.	Test division and refinery engineering division.	Yes	Staff assistants coordinate activities. Hold quarterly meetings.
15	Corrosion and materials of construction group	.....	No	Evaluate factors governing corrosion in laboratory tests.
16	Inspection group	Engineering and research departments.	No	Are attempting to set up group with management support.
17	Petroleum processing and corrosion engineer.	Engineering and research departments.	Yes	Good management support. Regular meetings.
18	Refinery engineering department.	Research and development laboratory.	No	Now have one man full time on corrosion in lab who runs laboratory and field tests.

Refiners Move in on Corrosion

. . . It's costing the industry $300,000,000 a year

by M. S. Northup

A STUDY by the Subcommittee on Corrosion, Division of Refining, American Petroleum Institute, shows that corrosion is costing the petroleum industry something in the neighborhood of $300,000,000 per year. Thus, we are spending for corrosion, in terms of cost per barrel of throughput, from 11 to 14 cents.

It seems apparent that this high cost of corrosion can be reduced by the application of known available methods, and that further reductions may be accomplished through technical studies and fundamental research.

As a step in the direction of reducing corrosion costs, a panel was established in the subcommittee on corrosion to obtain information on the organizational arrangements in the various companies for corrosion prevention and the approaches and techniques used to effect corrosion control. (Although this information was gathered under the auspices of the A.P.I.'s Subcommittee on Corrosion, Division of Refining, it should not be construed that the subcommittee is recommending any standard or generally accepted practice for the industry.)

Author is with Esso Research & Engineering Co., Linden, N. J.

Obtaining information . . . Representatives on the subcommittee on corrosion were requested to submit information about organizations in their respective companies concerned with corrosion matters and the way in which corrosion problems were handled. Replies were received from 18 companies. Table 1 summarizes the information submitted.

There are almost as many types of organizations as there are companies. These range from a one-man setup to well-organized and established groups. Only four of the companies have an organized corrosion committee or group. In these companies, regular corrosion meetings are held with attendance by others than the group if they have an interest in the problem or can contribute to its solution

Of great importance to the continued and successful operation of these groups is the strong support they receive from management. Without this support such a group cannot work effectively, nor will it be regarded as important as the value of its work justifies.

At the other extreme are those re-

REFINING

fineries where essentially no one, or perhaps one man alone, constitutes the corrosion committee. In these few cases the inspection department or group provides assistance or has the prime responsibility for seeing that something is done. In fact, in some companies with active corrosion groups the major responsibility for correcting corrosion problems falls to the inspection group.

However, in practically all companies reporting, assistance on corrosion problems is provided by other groups including engineering, metallurgical, process, and research personnel. Local engineering and process departments were reported in a few cases as having the prime responsibility in corrosion matters.

No set pattern . . . There is no apparent pattern on organizational setup to combat corrosion. Refinery preferences and local conditions dictate how corrosion problems are handled. Further, the lack of corrosion organizations within a company may be evidence of lack of top-level interest.

Some changes in recent months indicate that management is beginning to recognize the value of improved ways of handling corrosion problems. This may have been initiated in part by the report of the A.P.I. Subcommittee on Corrosion, which pointed out the high cost of corrosion to the industry.

As an indication of increased interest by management, several companies have engaged corrosion engineers within the last few years, and others are trying to hire corrosion experts. Also, one company has established a refinery corrosion committee within the last year, and a second is in the process of forming such a committee.

Scant information was submitted on the approaches and techniques used in corrosion control. These probably vary widely even in different refineries of the same company, and, therefore, would be quite difficult to compare. In some cases the inspection groups recommend remedial measures, while in others a corrosion engineer or metallurgist has this responsibility. However, assistance of other groups was available.

Finding corrosion . . . Practically all those reporting placed the responsibility for finding locations of corrosion on the inspection group. From this initial step, practices diverged considerably. With some, the inspectors continued their responsibility, while in others refining engineering, corrosion engineers, refinery technical departments, or refinery management might take over.

In one case it was reported that refinery management was interested only to the extent that service factor was affected. In the majority of cases several groups, including research and laboratory personnel, contributed to the solution of the problem.

Laboratory testing is carried on in most refineries when a problem arises. Such testing may be extensive if warranted and facilities are available, or only little work will be done. In general, analyses are made of streams to determine the corroding agents, products of corrosion are identified, and some metallurgical studies may be carried out. However, no standardized method of approach was reported.

A few companies reported that both laboratory and field tests are carried on. Several preferred field tests using coupons and, where possible, testing actual equipment such as bubble caps, exchanger tubes, sections of piping, and other similar items.

Laboratory tests were considered to have merit when new processes or process changes were contemplated. Several used laboratory tests for screening of inhibitors, but preferred removable coupons in plant streams for more accurate and trustworthy evaluation.

Little mention was made of corrosion testing in pilot plants, although at least two companies reported doing some work along this line. It would seem that pilot plants provide an excellent opportunity to obtain information on the corrosion problems that are likely to be met in new processes.

From discussions with a number of people it is apparent that more consideration is being given to such testing. Obviously, agreements must be reached with the process engineers, who are operating pilot plants with the primary purpose of finding out what the process will do. It has been possible in several cases to work out satisfactory arrangements to conduct corrosion tests as well.

The use of outside consultants or experts does not find wide favor. However, it would seem that a considerable amount of help can be and is being obtained from such sources. Some material suppliers render excellent service in this respect. Practically no reference was made to the large amount of corrosion information developed by various technical organizations, such as our own subcommittee.

Objectives of Model Organization

From a study of the information received, the objectives of a model refinery organization have been developed. Obviously, this will not fit all companies. It does show what can be done in a large organization in which management recognizes the cost of corrosion, and is willing to act to obtain maximum results from corrosion preventive measures.

The corrosion committee should be a staff organization with the following objectives:

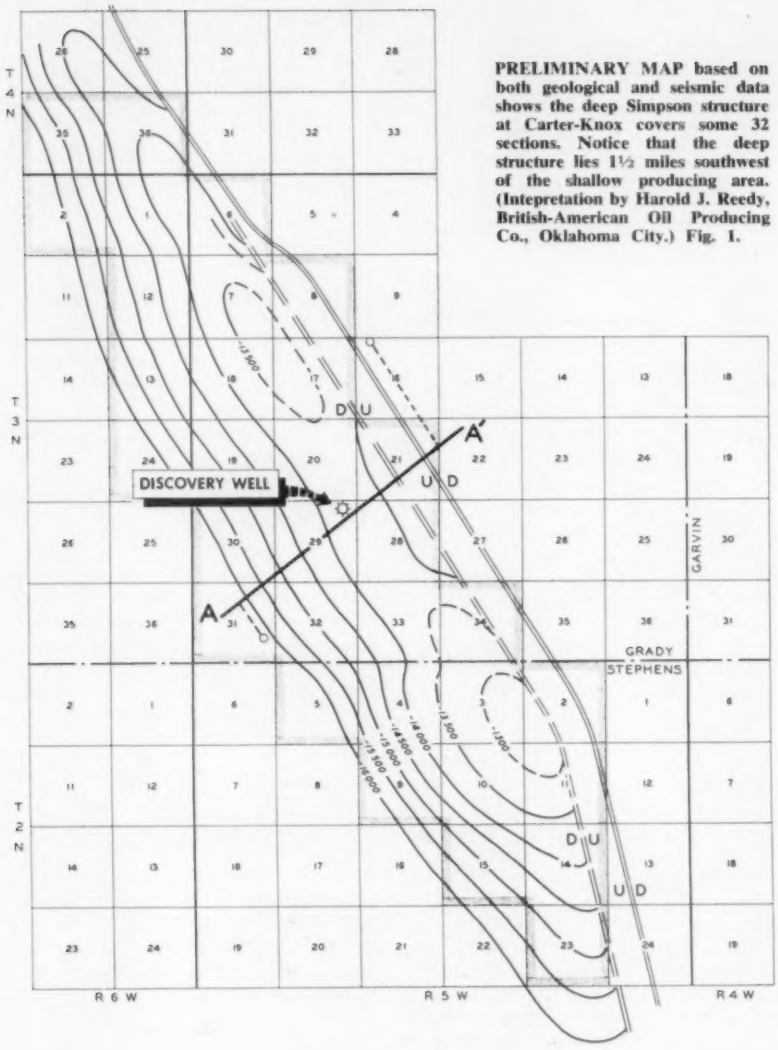
1. Provide an active organization, the members of which represent a cross-section of refinery corrosion experience and training.
2. Review and comment on refinery corrosion problems and their solution. Economic studies relating to the problem are a necessary part of this work.
3. Offer suggestions for the solution of current problems.
4. Aid in the coordination of plant-wide corrosion studies, and serve in a liaison capacity between refinery technical groups.
5. Recommend what problems require new research and study.
6. Compile and maintain a file of committee transactions and other corrosion technology. This file should be adequately indexed and accessible.
7. Transmit to all interested groups and to top management summary information of committee activities.
8. Cooperate with technical societies and groups whose purpose is to reduce corrosion.

Members of such a committee must be given the necessary time to regularly attend meetings and perform the duties entailed. The actual membership can be varied depending upon the organization in a given refinery. It should have representation of the petroleum processing department, research laboratory, maintenance, and engineering departments. The committee should have the authority to use the services of all groups who have something to contribute to a given problem.

Conclusions

The completeness with which information was submitted varied considerably and the names given to similar groups in different companies were not the same. Therefore, it is somewhat difficult to draw comparisons and conclusions. Those that seem apparent to the panel are:

1. Each company has organized in its own way to handle corrosion matters. There was no set pattern on organizational setup, nor on the size of groups handling corrosion.
2. Refinery preferences and local conditions seem to dictate how corrosion problems are handled.
3. Active corrosion committees have strong support of top management. In some companies without such groups, it appears quite evident that management gave little attention to organizing against corrosion.
4. There is an increasing amount of interest being shown by companies in establishing some type of organization to combat corrosion.



PRELIMINARY MAP based on both geological and seismic data shows the deep Simpson structure at Carter-Knox covers some 32 sections. Notice that the deep structure lies 1½ miles southwest of the shallow producing area. (Intepretation by Harold J. Reedy, British-American Oil Producing Co., Oklahoma City.) Fig. 1.

Each new well is a wildcat on the trend . . . It appears doubtful that more than three or four deep tests will be running simultaneously until later in the development. Thus the operators have planned a . . .

5-Year Drilling Program for Carter-Knox

by Norman S. Morrisey
Drilling-Development Editor

OPERATORS in the newly discovered deep Simpson producing area on the southwest flank of the old Carter-Knox oil field are planning a 5-year drilling program. Limited data available at the moment point to a major gas-condensate reservoir that will require at least 30 wells.

Since the discovery well is thought to be near the crest of the deep structure and at 15,310 ft. had tested the third Bromide sand, it is expected that the average development well to test this sand will be 15,960 ft. deep. Total cost to drill and complete a well at this depth is estimated to be $875,000. Depth to test the Arbuckle on this structure should be slightly less than 17,000 ft., and should production be found in the Oil Creek or Arbuckle, the total cost of these 17,000-ft. wells will probably exceed $1,250,000.

British-American Oil Producing Co. touched off this deep-drilling play with the successful completion of its 2 Harrison (SE NW NE 29-3n-5w). The well was completed for an open-flow potential of 31,000,000 cu. ft. of gas per day plus 163 bbl. of condensate per M.M.c.f. of gas. British-American is currently completing the confirmation test, the 1 Reed. It lies 1½ miles north-northwest of the discovery and is 260 ft. lower than the discovery well on the second Bromide sand.

Trend play shaping up . . . Drilling has already outlined the shallow producing structure at Carter-Knox. This area is 11 miles long and 1½ to 2 miles wide. The deep Simpson structure parallels the shallow axis, but lies 1½ miles southwest of it (see map, Fig. 1).

Seismic surveys have mapped an elongate anticline (Figs. 1 and 2) that is

at least 12 miles long. Data presented at a recent Oklahoma Corporation Commission hearing indicate that all or parts of 32 sections may produce. However, the limits of production on the structure will depend on the thickness of the gas-condensate column which can be determined only by development drilling.

The combination of the seismic data and the known surface and subsurface trends indicates that a deep-drilling play is shaping up; this play may eventually cover a narrow strip 15-20 miles long if the Simpson production extends northwest into the Chitwood area. Both Chitwood and Carter-Knox are on the same subsurface trend and Simpson production on the flank of Carter-Knox may be the tipoff to deep Simpson production at Chitwood.

Long-range drilling . . . Slow but continuous drilling is planned for the Simpson trend. These 15,000-ft. Simpson tests are expensive. And even under the best of conditions, drilling to these depths is hazardous. The discovery well cost in the vicinity of $764,000 and required 240 days from spud to completion.

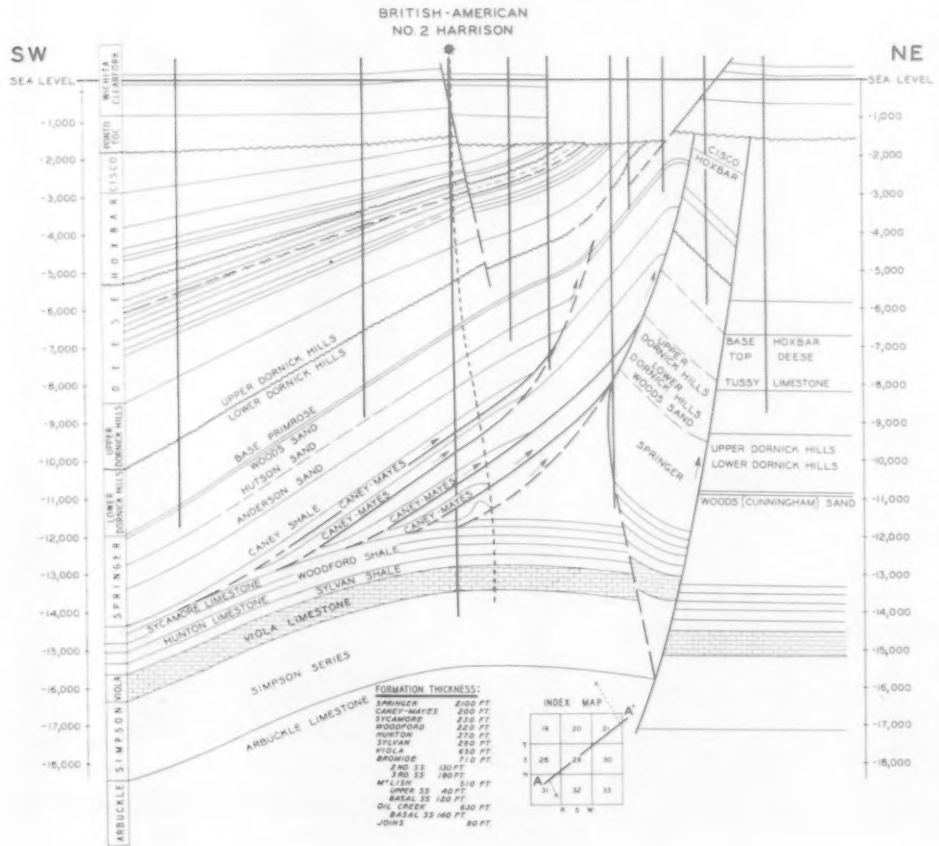
Although several companies hold acreage along the trend, drilling will proceed at a cautious pace. Each new well is a wildcat on the trend because of the complex geology and the present well spacing of 640 acres. It appears doubtful if more than three or four deep tests will be running simultaneously until the latter stages of development drilling. For this reason, operators feel that it will take a minimum of 5 years to completely outline the trend.

Well spacing . . . Operators feel that the gas-condensate reservoir will be adequately drained with 640-acre spacing. Although the reserves appear high, wells on 320-acre spacing probably will be uneconomic, according to expert testimony presented before the Oklahoma Corporation Commission. Estimated reserves are 26,754 M.c.f. per acre plus 1,911 bbl. of condensate per acre. This means that wells on 640 acres will gross $5,434,010, based on present-day prices for gas and condensate, but the ratio of profit to investment is only 1.26:1.

Drilling problems . . . British-American successfully solved one drilling problem on the discovery well. Purposely, the surface location was staked downdip. The bottom of the hole at Bromide level is 962 ft. northeast of this surface location. Rather than try to maintain a straight hole, the hole was allowed to drift updip. This permitted the contractor to drill rapidly without the problem of keeping the hole vertical. The contract on the discovery well permitted the contractor a deviation of 1° per 1,000 ft. of hole; however, the rate of change could not exceed 1½° in any 100 ft. of hole drilled.

Blowouts are a definite hazard when drilling the high-pressure Simpson sands. And in the discovery well, lost circulation became a problem in these sands.

Type of reservoir . . . Engineering studies have shown this to be a retrograde gas-condensate reservoir. The peculiar thing about this type of reservoir is that at the original reservoir pressure of 9,400 psi. all fluids are in a gaseous phase in the reservoir. They remain in a gaseous phase until a pressure of 5,640 psi. is reached at which time some of the liquid begins to condense out. Since the surface flowing pressure is approximately 6,400 psi., no liquid is present until after the gaseous mixture has passed through the surface equipment.



EDITOR'S NOTE: Since the writing of this article, British-American Oil Producing Co. has established a new Oklahoma (deep) production record at its 1 Reed (SW SW NE 20-3n-5w). The Reed is the first confirmation test on the trend. It flowed 3,400,000 cu. ft. per day with 143.7 bbl. of condensate per hour on a 5-hour test through perforated intervals 15,220-15,320 ft. in the second Bromide and 15,575-15,645 ft. in the third Bromide.

COMBINED seismic and geologic cross-section (A-A', Fig. 1) reveals a fairly simple Simpson structure in spite of the complex thrust faulting in the incompetent beds of Pennsylvanian and Mississippian age. (Interpretation by Harold J. Reedy, British-American Oil Producing Co., Oklahoma City.)

ELEMENTS OF FIELD PROCESSING—29

How to Calculate Pipe Diameter Needed

by Dr. John M. Campbell

SITUATIONS often occur where it is desired to calculate the line diameter needed for a given flow rate and pressure drop or the capacity of a given size line under fixed pressure conditions. The friction factor f and Reynolds number (Re) both contain diameter and velocity terms. Therefore the use of the correlation of f vs. Re involves a trial-and-error solution if either diameter or capacity is desired.

This trial and error may be prevented by eliminating the variable to be determined. If Q_L represents the volume rate of flow:

$$Q_L = (\pi/4)\, D^2 v$$

$$Re = \frac{D v \rho}{\mu} = \frac{Q_L \rho}{0.785\, D \mu}$$

$$\Delta P_f = \frac{2 f L v^2 \rho}{g D} = \frac{32 f L Q_L^2 \rho}{\pi^2 D^5 g}$$

Author is chairman, School of Petroleum Engineering, University of Oklahoma, Norman.

where the nomenclature is the same as in preceding parts.

If the equations for f and Re are solved for D you have:

$$D^5 = \frac{32 f L Q_L^2 \rho}{\pi^2 g \Delta P_f} = a f \quad (1)$$

and

$$D = \frac{4 Q \rho}{\pi \mu Re} = \frac{b}{Re} \quad (2)$$

where a and b represent the known terms.

If D is eliminated between Equations 1 and 2:

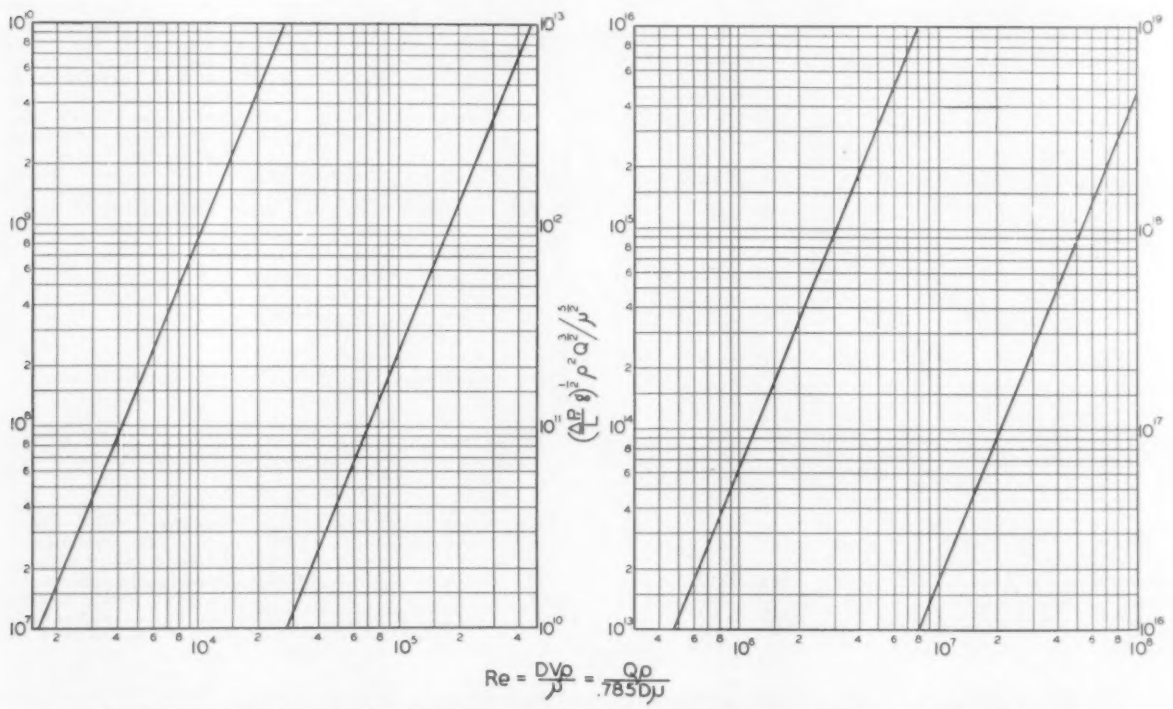
$$b^5/a = f\,(Re)^5 \quad (3)$$

The above expression gives the relationship of f and Re in terms of the quantities necessary to find the diameter D. From a graph of f vs. Re (as shown in Part 28) one may construct a graph of b^5/a as the ordinate and either Re or f as the abscissa. If the value of b and a are substituted back into Equation 3 and the terms combined:

$$\frac{b^5}{a} = \frac{32 \Delta P_f g Q_L^3 \rho^4}{\pi^3 L \mu^5} \quad (4)$$

Fig. 1 is a log-log plot of the square root of the last term of Equation 4, on the ordinate vs. Re on the abscissa. The value of the ordinate may then be calculated knowing the pressure drop, elevations, line length, and liquid properties. This is then extended horizontally to the intersection of the line and then vertically to obtain the value of Re, from which the diameter D may be calculated. By this means the diameter D is obtained, directly.

Sensitivity of calculation . . . The correlation shown is derived from the commercial pipe curve in the turbulent flow region for the f vs. Re plot in Part 28. Since Re or its equivalent appears in both ordinate and abscissa the calculated value of D is quite insensitive to the friction factor f. This is true not only because of the relation-



PIPELINE SIZE can be found by this chart. The correlation eliminates trial-and-error estimation of friction factor. Fig. 1.

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CASE HISTORY Nº AM-V-6122

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Aboard barge G.P.5 on LAKE MARACAIBO

OWNERS & OPERATORS: Compania Shell de Venezuela Ltd., Maracaibo, Venezuela.

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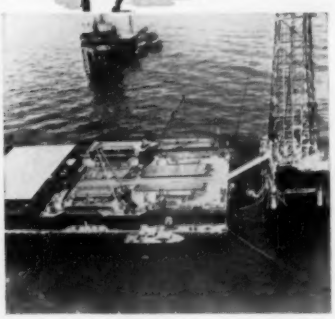

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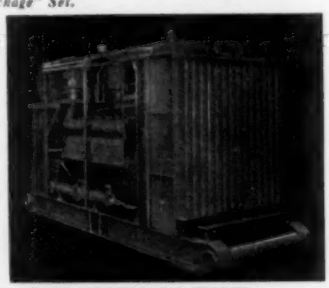

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SELF-ALIGNING SAND SEALED-OFF PUMPS Fig. 600-800

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Fig. 700A Heavy Duty Seating Device

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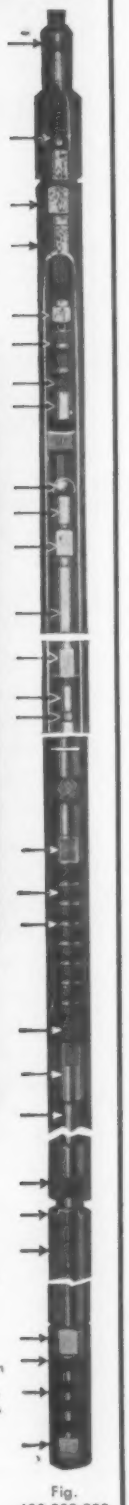

Fig. 600-800-900

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V. A. Sauls, Heidelberg, Miss.
B-H Pump Service, Selman City, Texas
Jack Yates Pipe & Supply Co., Gladewater, Texas

SALES & SERVICE STORES

Seminole, Okla.
Edmond, Okla.
Shidler, Okla.
Drumright, Okla.
Healdton, Okla.
Kilgore, Texas
Oil City, Miss.
Natchez, Miss.
Vivian, La.
Big Rapids, Mich.
Stephens, Ark.
Heidelberg, Miss.
Eureka, Kansas

ship of the variables but because the inclusion of the same terms on both coordinates tends to give a degree of misleading accuracy. However, Fig. 1 is suitable for all commercial design applications for the error is less than the difference between available pipe sizes.

Example: 12,000 bbl. per day of 1.04 specific gravity brine having an absolute viscosity of 1.12 cp. is pumped 12 miles through Transite pipe to an input well. The pump discharge pressure is 150 psig. and the wellhead pressure will average 15 in. Hg vacuum. The pump discharge is 60 ft. above the wellhead. If Transite pipe is available in diameters of 4, 5, 6, 7, 8, 10, and 12 in. calculate the necessary line size.

Physical properties of brine:

Sp. gr. = 1.04 and $\rho = (1.04)\ (62.4) = 64.9$ lb./ft.^{3}

Viscosity (abs.) = 1.12 cp.

$\mu = (1.12)\ (0.000672) = 0.000753$ lb./ft.-sec.

Capacity of line:

$$12{,}000 \text{ bbl./day or } Q_L = \frac{12{,}000 \times 5.61}{24 \times 3{,}600}$$

$$= 0.779 \text{ ft.}^3\text{/sec.}$$

Linear velocity = Q_L/A but D and, therefore, A are unknown.

L = 12 miles or 63,300 ft.

Pressure conditions:

Pump discharge pressure = 150 psig.

Wellhead pressure = 15-in. Hg = 7.35 psi. below atm.

Elevation of wellhead with reference to pump discharge = 60 ft. as shown in the sketch.

Energy balance:

$\Delta P = (150 + 7.35)\ (144) = 22{,}650$ lb./ft.^{2}

$\Delta X = (60)\ (64.9) = 3{,}890$ lb./ft.^{2}

So $\Delta P_f = 22{,}650 + 3{,}890 = 26{,}540$ lb./ft.^{2}

(a) Calculate the diameter of the original line:

From the chart:

$$\text{Re} = 1.53 \times 10^5 = \frac{Q\rho}{0.785\ D\mu}$$

and

$$D = \frac{(0.779)\ (64.9)}{(0.785)\ (1.53 \times 10^5)\ (0.000753)}$$

$$= 0.559 \text{ ft.}$$

or

$$D = (0.559)\ (12) = 6.7 \text{ in.}$$

Use 7-in. i.d. Transite pipe.

Nomenclature

D = internal pipe diameter, ft.
f = friction factor
g = gravitational constant, ft./sec.^{2}
L = length, ft.
Q_L = flow rate, ft.^{3}/sec.
ΔP_f = pressure drop due to friction, lb./ft.^{2}
v = velocity, ft./sec.
$\pi = 3.1416$
ρ = density, lb./ft.^{3}
μ = viscosity, lb./ft.-sec.

$$\frac{(\Delta P_f\ g/L)^{1/2}\ \rho^2\ Q_L^{3/2}}{\mu^{3/2}} = \frac{[(26{,}540)\ (32.2)/63{,}300]^{1/2}\ (0.779)^{3/2}\ (64.9)^2}{(0.000753)^{5/2}}$$

$$= \frac{(3.68)\ (4{,}200)\ (0.689)}{1.58 \times 10^{-8}} = 6.73 \times 10^{11}$$

ON THE JOB . . . . . IN THE FIELDS

Self-propelled drilling ship unveiled

THE SHIP is equipped with a unique pipe handling and racking system.

COMPARED to land-based drilling rigs, the new coring ship that General Petroleum Corp. recently placed in service in California coastal waters represents the difference between trailer-mounted and self-propelled rigs.

The 176-ft., 32-ft. beam M. V. Torry is the West Coast's first self-propelled vessel to be equipped for midship drilling. Most of the other eight drilling vessels now enaged in locating and evaluating offshore oil structures are converted flat-bottomed landing craft which must be towed from location to location. Some smaller vessels are self-propelled but all drilling is carried out over the side.

Shallow drilling . . . Capable of carrying out all simple drilling operations that a rig can do on land, the Torry is admirably adapted for shallow-core drilling. Only 1 day usually is required to drill a 500-ft. core hole (the legal limit for unleased state submerged lands). Being self-propelled, the Torry thus can move onto and off a location much faster than a towed barge.

Drilling techniques being used are the same as those of most other West Coast companies *(see The Oil and Gas Journal, February 27, 1956, page 130).*

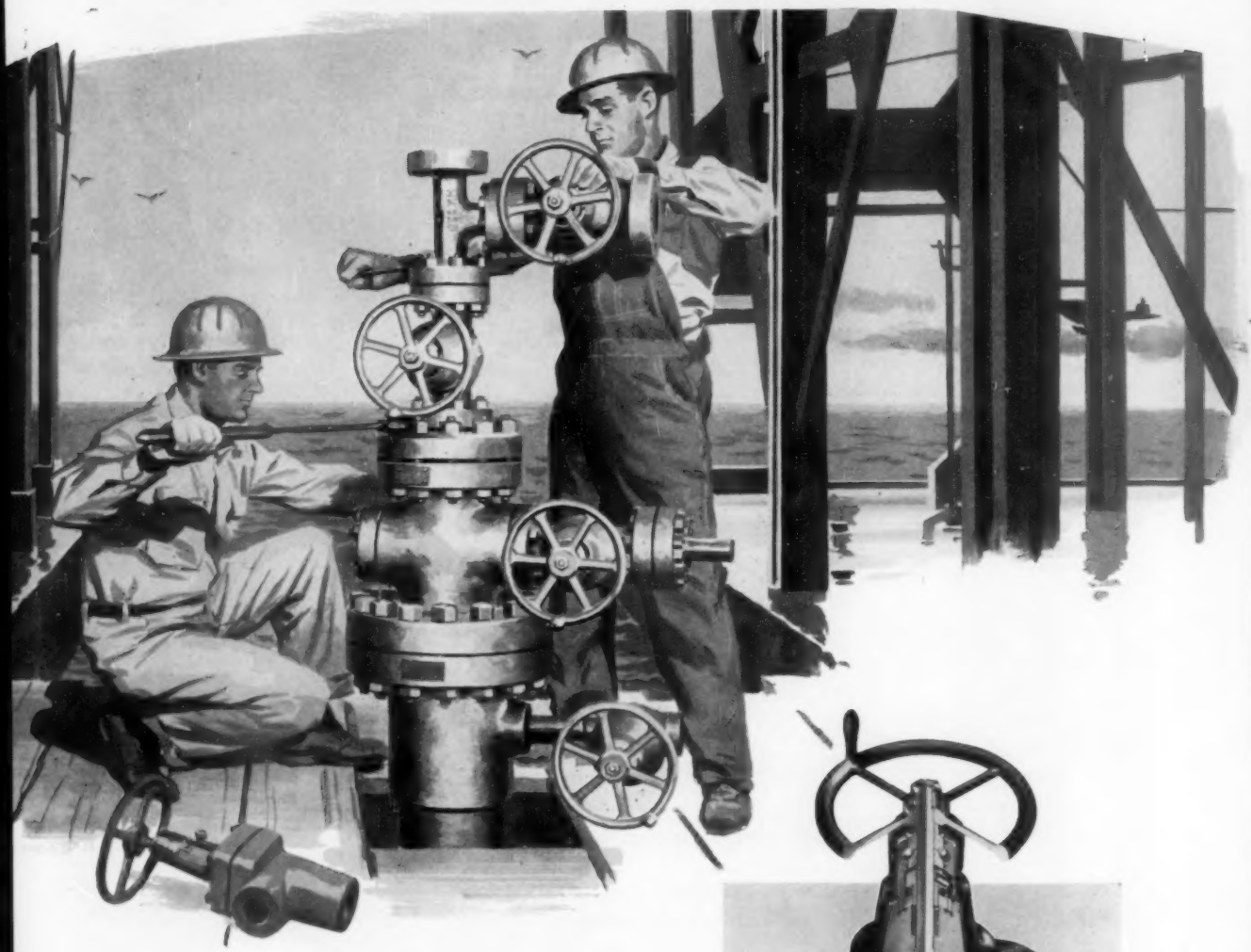
Circulation . . . After surface pipe has been set, continuous mud circulation is maintained by means of a rubber hose.

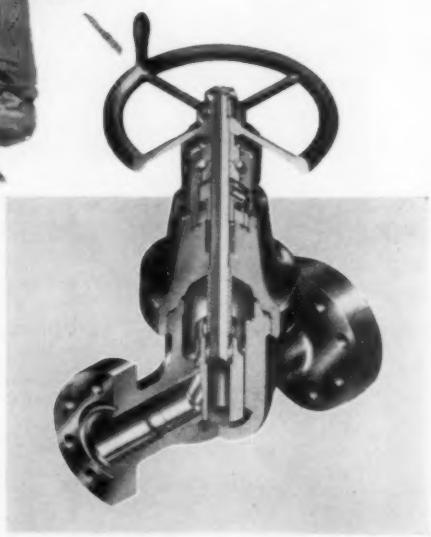
A special guide elevator keeps the drill tubing in a vertical position under the water. The bottom part of this system, called a guide spider, guides the bit into position when drilling starts and after a bit has been changed. When total depth is reached the hole is plugged and the submarine drilling equipment is pulled to the surface.

Because of its adverse affect on the ship's stability if racked in the mast, drill tubing is always laid down. This is accepted practice on all West Coast barges but a unique method is being used on the Torry.

Single joints . . . The drill string is broken out in singles. The lower end of the joint is placed on a continuous belt and the elevators lowered as the pipe is pulled down the walkway. After the elevators are unlatched the belt conveys the pipe farther down the walk. From there it is rolled onto the pipe racks.

Only the beginning . . . years of service ahead





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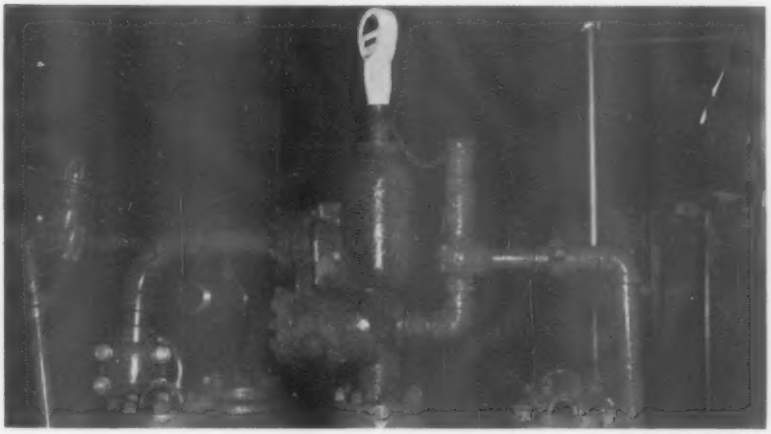


Extra pump nipple ready when needed

THIS nipple was placed in reserve by Russell Livingston, driller for Helmerich & Payne on Rig 37 in the Williston basin district. When the nipple being used on the discharge of the mud pump washes out, the spare will be handy. Down time will be cut since the new spare nipple is cut to exact measure and can be installed quickly.

Although the washout didn't occur during Livingston's tour, the new nipple tied to the faulty nipple was ready for the next crew when they needed it.

Notice the shear pin in the relief valve is covered to prevent injury from the flying pieces. This cover is chained fast so it cannot become lost.

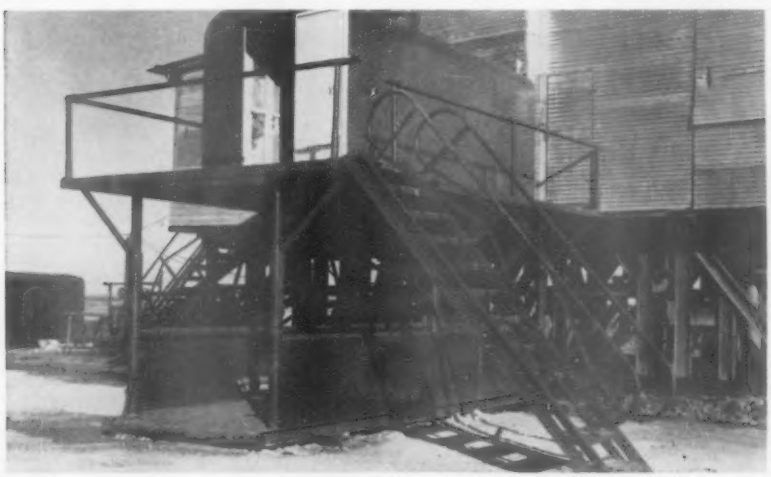
The nipple can be attached to the pump with a piece of soft rope quickly and easily.

Handy fishing socket

A FISHING socket is conveniently placed in the corner of the derrick to be used in case of a twistoff by Taggart Drilling Co., of Big Rapids, Mich.

While the pipe is being pulled from the hole, one roughneck loosens the nuts on the clamp and the tool is swung over to the rotary table with a cat line.

It is a simple operation to insert the socket into the hole as soon as the broken piece is removed from the string and start right back into the hole. Minutes are saved that would be used to take the tool from the tool box which could mean the difference between pulling the fish and a washover job.



Dog house support stores extra pipe

ON this rig of Great Western Drilling Co., the support for the dog house is used to hold short pieces of pipe for use around the rig. When the rig is moved, the piping for the rig is placed in this bin.

After the dog house has been loaded, the pipe bin is then picked up and set down at the next location and the dog house placed on top as before. The bin is then always handy to the rig for making a selection of small pipe and fittings for use around the rig.

Charged fence for well

STRAIN DRILLING CO., of Denver, Colo., keeps stock away from the well site by a single electrically charged wire. The portable fence charger, wire, and short posts are moved easily from location to location in a light truck or car.

Posts are driven to include all the operations and if possible the fence is made to include an existing fence which has a cattle guard for entry. A steel post serves as ground for the charger. An ordinary storage battery furnishes the electrical power.

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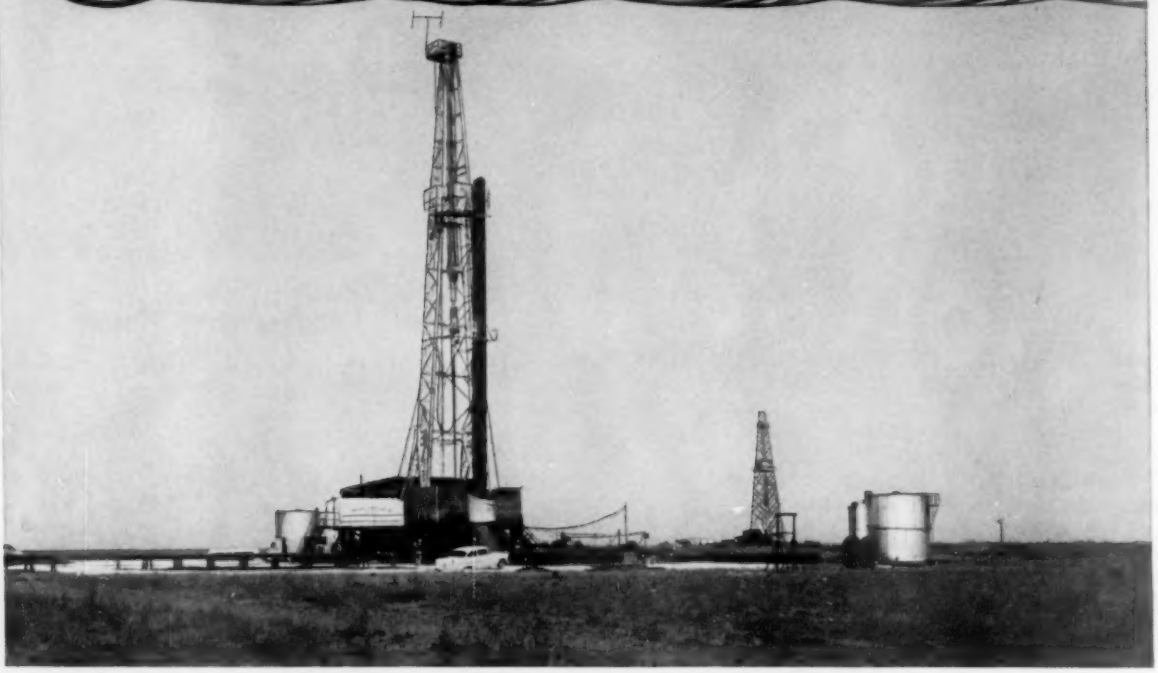

Higher Safety Factor, Faster Drilling with New VHS Rotary Drilling Lines

More and more operators are learning of the many advantages of new VHS rotary drilling lines. Made from a new grade of steel for Wire Rope, they are 15% stronger than Improved Plow Steel lines, the strongest grade available before VHS was introduced.

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Less Down Time, Faster Drilling

You can drill deeper before increasing the number of parts of line with new VHS. You can make round trips faster. And VHS' extra strength eliminates, in many cases, any necessity for regrooving sheaves or buying new blocks to use larger diameter lines for higher safety factors.

Tougher

New VHS is tougher, too. Its extra strength and toughness give it greater resistance to abrasion and higher resistance to peening . . . both important factors in maintaining diameter and shape. If regular adaptable cut-off practices are followed, ton-mile advantages should result.

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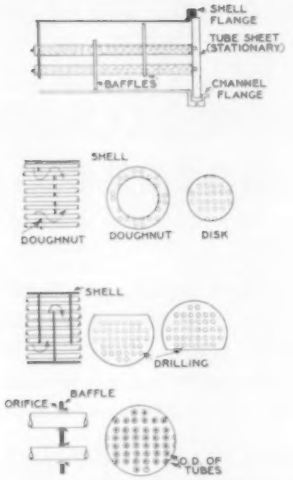
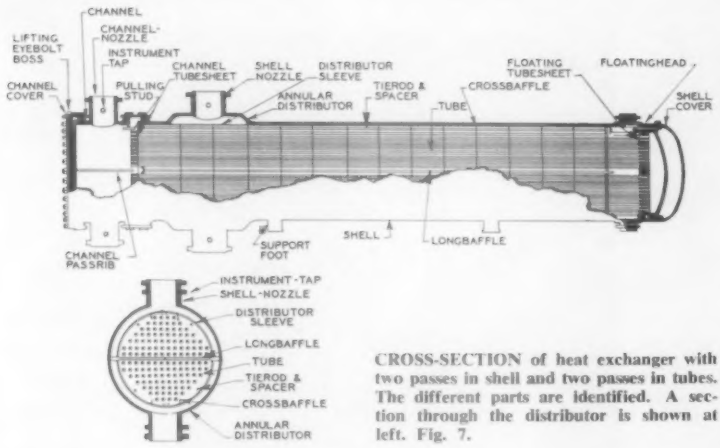
JOB IMPROVEMENT FOR THE PROCESS FOREMAN—81

Why Baffles Are Included in Exchangers



VARIOUS baffle arrangements in exchangers. Fig. 6.



CROSS-SECTION of heat exchanger with two passes in shell and two passes in tubes. The different parts are identified. A section through the distributor is shown at left. Fig. 7.

BAFFLES add considerably to the cost of an exchanger and make cleaning difficult, but are an essential part of each heat exchanger. In order to be effective, baffles must be installed so that there is a minimum of bypassing around the baffle. This is done by reducing to a minimum the clearance between baffles and shell. Sufficient clearance must be allowed, however; to permit tube bundle to be removed readily. The baffles are held in place by tie rods on which spacer spools are placed to keep the baffles from moving. Fig. 6 shows a typical baffle arrangement.

Most heat exchangers in this refinery are limited to the one type of baffle that has been found to be most satisfactory, but heat-exchanger equipment may be designed to incorporate any one of several types of baffles.

Crossflow baffle . . . Probably the most common transverse baffle is the segmental or crossflow type shown in Fig. 6. This type of baffle causes the shellside fluid to flow back and forth across the tube bundle and is suitable for use with fouling liquids or large volumes. The majority of all the heat-exchange equipment in this refinery is of this type.

Disk-and-ring, or disk-and-doughnut baffles (see Fig. 6) force the fluid to flow successively from the outside of the tube bundle toward the center and back again to the outside. These baffles are slightly more expensive than the segmental type and have no particular advantage over them.

Orifice baffles, shown in Fig. 6, force the fluid to flow at high velocities through the space between the baffle and the tubes. These baffles can be used for small or moderate flow rates and clean streams. Their rapid fouling rate, however, precludes their use in refinery equipment because of the high pressure drop and inaccessibility for cleaning. Much of the older equipment at gas plant No. 3 is of this type, but as retubing becomes necessary, segmental baffles are being used as replacements.

Longitudinal baffles consist of flat plates which extend all the way across the shell. These baffles may be used to obtain counterflow of tubeside and shellside fluids, as shown in Fig. 7. Also, these baffles are used in condensers to distribute the flow of vapor onto the length of the tube bundle when the vapor inlet nozzle is located in the center of the shell. The use of this type baffle in the plant is avoided as much as possible because such a baffle makes shellside cleaning difficult.

Impact baffles are frequently used and are located over the tubes at a point opposite the inlet shell nozzle. They are used to prevent erosion caused by impingement of the incoming fluid on the tubes and to prevent vibration. They also help to distribute the flow.

Heat exchangers are designed and built to perform a given duty under the thermal-design conditions. When in operation, these conditions are apparently altered, malfunction of the equipment results. Improper function of the exchanger may be recognized in too low or too high a temperature or excessive pressure drop. These inadequacies may be due to a number of causes which will be listed in the next installment.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.

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A-5276

by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

What Price Cat Cracking Plants

I find little in the literature about the economics of catalytic cracking. Can you send me anything regarding this?—J.A.S.

Costs are so intimately related to the particular environment of each plant and the particular equipment included in the plant that no one wants to state average costs. Nevertheless, the average construction costs of catalytic cracking plants shown in Fig. 1 are based on a study of the cost of more than 100 plants of the fluid (mainly) the T.C.C. types. Costs may be brought to date by means of the Nelson Refinery Construction Index which is published in the first issue each month in the Journal.

Operating cost data are even less satisfactory. However, Table 1 indicates costs that have been published in the technical literature.

TABLE 1
Approximate Operating Costs and Operating Factors for Catalytic Cracking and Related Operations (1956 Except as Indicated)

Operation:
- Catalytic cracking and gas recovery—28-50 cents per barrel feed.
- Topping and catalytic cracking—45-93 cents per barrel crude.
- Topping only—7.5-19 cents per barrel crude.
- Vacuum flashing—7.5-18 cents per barrel feed.

TABLE 1 (Continued)

Royalties:
- Catalytic cracking—5 cents per barrel feed.
- Polymerization or alkylation—20 cents per barrel product.

Treating:
- Sweetening (copper chloride) — 3.2-5.3 cents per barrel feed.
- Complete (cracked naphtha)—26 cents per barrel naphtha.
- Inhibitor handling—0.34-2.2 cents per barrel.

Steam consumption:
- For cracked gasoline—30 lb. per barrel gasoline.
- For alkylate gasoline—700 lb. per barrel alkylate.
- Catalytic cracking plant—17-25 lb. per barrel feed (1953).
- Topping plant—40-172 lb. per barrel crude (1939).

Water required:
- Topping and cracking—13-44 bbl. per barrel crude (1938).

Electricity required:
- Catalytic cracking—0.27-1.2 kw. per barrel feed.
- Two-stage distillation—0.6 kw. per barrel crude.
- For polymer gasoline—0.34 kw. per barrel gasoline.
- For alkylate gasoline—5.8 kw. per barrel gasoline.

Finally, the approximate installed costs of related plant equipment (1946) are:

Topping or atmospheric distillation—$23-78 per daily barrel feed.

Vacuum flashing—$26-50 per daily barrel feed.

Alkylation plants—$600-700 per daily barrel product.

Polymerization plants—$600-750 per daily barrel product.

Copper sweetening—$10-37 per daily barrel feed.

Inhibitor injection—$0.5-4.90 per daily barrel feed.

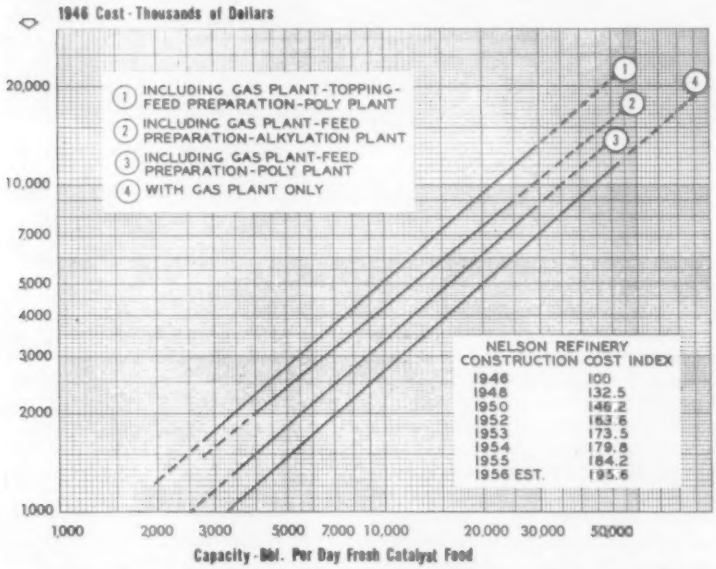

Fig. 1—Approximate installed cost of catalytic cracking and related plants. (1946—see Nelson Index.)

Indexes of Cost of Pipe and Plate

Would not Code 10-14-26 of the Bureau of Labor Statistics be better for plate steel than the boiler and tank code used in your Quarterly Itemized Cost Indexes—and the new code on 6-in. IPS pipe would seem to be a better index of piping costs than the "black iron" pipe used in the Itemized Indexes?—H.L.S.

Steel plate Code 10-14-26 for ¼-in. hot rolled plate is certainly a better code for tanks and vessels than Code 10-72. It has been used elsewhere in the Cost-imating Series in The Oil and Gas Journal but has not heretofore been shown in the quarterly listing of Itemized Cost Indexes. It will appear in future quarterly issues.

Likewise, the index for 6-in. line pipe (6⅝-in. o.d.) will also be carried in the quarterly Itemized Cost Indexes. However, difficulty in establishing a base price for 1946 makes it necessary to state only an approximate index. Examination of the indexes for other fabricated steel items indicates that the base price for 1946 of line pipe would be about $72.00 per 100 ft. f.o.b. mill in carload lots (about $90.00 at base points as shown in Cost-imating No. 19, October 15, 1956, page 147). Indexes in Table 1 use such a basis.

TABLE 1—COST INDEXES OF STEEL PLATE AND STEEL LINE PIPE

	Steel plate*	Line pipe†
1946	100	100
1947	117	‡121
1948	131	‡130
1949	142.1	‡152
1950	152.3	‡159
1951	160	‡172
1952	163.1	‡176
1953	175.8	‡187
1954	187	200.5
1955	195.1	211.8
Nov. 1956	225	252.5

*Bureau of Labor Statistics Code 10-14-26 (2.467 cents per pound, 1946). †Estimated base value for 1946. Bureau of Labor Statistics Code 10-14-58 ($72.00 per 100 ft., 1946). ‡Estimate from prices of other similar steel materials.

by Robert L. McIntire
The Datics Corp.

Using Electronic Computers in the Oil Industry Part 5

Organizing Design Data

WHEN considering the use of automatic computers for process engineering calculations, one of the earliest problems to be met is that of organizing the design data. When an engineer sets out to perform a series of adiabatic flash calculations or to design a fractionator, he first assembles a set of graphical data. For the calculations mentioned, he will accumulate equilibrium, vapor enthalpy, and liquid-enthalpy data for each component in the system. If his process is at a constant pressure, he will represent these data as functions of temperature only.

The equilibrium data would normally be plotted on semilog paper and the enthalpy data would be recorded on coordinate paper. During the desk calculation, the engineer must constantly refer to these charts to evaluate the functions at any given temperature.

There are two commonly used methods for accomplishing this same objective in machine calculations: (1) Table storage with lookup and interpolation, or (2) curve fitting with equation evaluation at desired temperature values.

The first method usually (but not always) requires a prohibitive portion of the total memory capacity of the machine. Although methods exist for optimizing the intervals between table entries (with a consequent reduction in space requirements), the curve-fitting procedure has received a much wider acceptance of computer users.

With curve-fitting methods, the problem is to discover an analytical expression which will adequately represent the original data. Various curves have been used. Since equilibrium data is somewhat proportional to vapor-pressure data, the familiar Antoine equation can be adopted:

$$\ln K = A - B/(C + T) \quad (1)$$

This expression is handy to use since it can be solved readily explicitly for either temperature or the equilibrium value. The A, B, and C values are constants which vary for each component considered.

Equation 1 required the machine to compute an antilog at each assumed temperature. Since this operation is normally about 150 times as costly, timewise, as a simple arithmetic operation, a polynomial representation of K data is sometimes preferred.

$$K = D + ET + FT^2 + GT^3 + IT^4 + JT^5 \quad (2)$$

Equation 2 requires that the memory capacity allotted to the storage of the curve-fitted constants be doubled. However, an equilibrium value can be determined more rapidly here than by using Equation 1.

Polynomial representation is normally quite accurate for enthalpy data. A quadratic is frequently used:

$$h = M + NT + PT^2 \quad (3)$$

Once these empirical constants for each component are stored within the computer, the machine has the ability to evaluate both the function itself and the rate of change of the function with temperature. For example, from Equation 3 we can write:

$$dh/dt = N + 2PT \quad (4)$$

This capability is tremendously important when using the machine to solve nonlinear process problems. A later article in this series will explore this application.

The normal method of obtaining the constants in these empirical equations is by curve fitting using the method of least squares. From any systematic data, this method develops constants which minimizes the sum of the squares of the differences between the given value and the computed value of the ordinate. To obtain a good "fit" to an expression like Equation 3, enthalpy data at 10 to 20 temperature levels are read into the machine.

The matrix operations by the least squares procedure result in empirical constants which represent a smooth curve through the existing data.

This stage of data preparation is one of the most laborious requirements for performing machine calculations. If we were required to write down the liquid enthalpies, vapor enthalpies, and equilibrium values at 20 different temperatures for each of 15 components in a proposed adiabatic flash, this operation would involve writing 920 numbers. The engineer may prefer to perform the calculation manually! The operation is considerably shortened by choosing a smaller number of equally spaced temperatures. As long as the number of data points exceeds the number of constants in the final equation, the least squares procedure will smooth the original data.

There is a limit to the savings which can be accomplished by reducing the number of data points. If an odd number of data is taken at equal increments in temperature, it is possible to solve almost directly for the value of the empirical constants. This procedure is explored fully on page 266ff in "Applied Mathematics in Chemical Engineering" by Sherwood and Reed.

For example, the constants M, N, and P in Equation 3 can be determined by choosing enthalpies at only five values of temperature. Let Δ equal the number of degrees between T values. If we transform Equation 3 with the new variable of x = T − T midpoint, we have a new equation:

$$h = m + nx + px^2 \quad (5)$$

In this equation, x takes on the values:

$$-2\Delta,\ -1\Delta,\ 0,\ 1\Delta,\ 2\Delta$$

Thus, each value of x differs from other x values only by an integral coefficient. This coefficient, k, has the values:

$$-2,\ -1,\ 0,\ 1,\ 2$$

In the reference given above, the proof exists that the constants M, N, and P can be obtained in terms of Δ, k and the five enthalpy values:

$$M = (1/35)\,(18\,\Sigma h - 5\,\Sigma k^2 h) \quad (6)$$

$$N = (1/10\Delta)\,(\Sigma k h) \quad (7)$$

$$P = (1/14\Delta^2)\,(\Sigma k^2 h - 2\,\Sigma h) \quad (8)$$

The desired constants are then obtained in terms m, n, and p and the midpoint temperature, T_M:

$$M = m - n\,T_M + p\,(T_M)^2 \quad (9)$$

$$N = n - 2p\,T_M \quad (10)$$

$$P = p \quad (11)$$

This procedure is recommended because it conserves machine time.

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Part 4

Corrosion of Ferrous-Metal Tubing

Pitting Spots Corrosion Attack on Steel

by Thomas M. Krebs

NOT only may metal loss be considerable with the formation of iron sulfide scale but the presence of voluminous layer-like scale (see Fig. 6) readily leads to overheating. Plugging is caused also by dislodgement of the brittle corrosion product in equipment.

Generation of hydrogen sulfide in the presence of hydrogen in the reforming process is considered the heart of this problem even though the mechanism of attack is still under study. The addition of small amounts of chromium which are effective in resisting attack by sour oils has not helped significantly in catalytic reformer service. About 12 to 16 per cent chromium is needed to confer increased resistance. Even better resistance being obtained with the chromium nickel austenitic stainless steels.

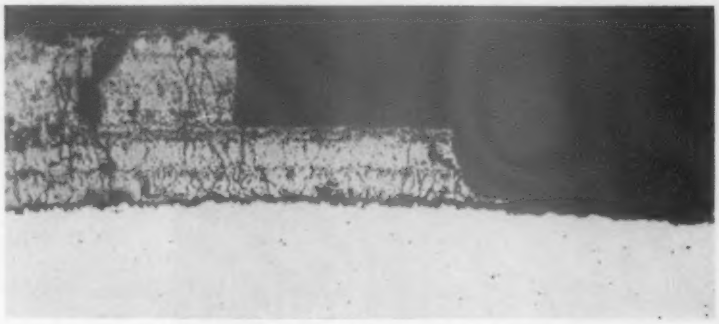
Actual cases . . . The most common and widely recognized form of local corrosion is pitting. Some cases of local attack of ferrous refinery materials show this type of corrosion represents a nonuniformity of attack which in turn results from some nonuniformity in the metal or its conditions of environment.

Pitting of carbon-steel tubing used to heat untreated water containing oxygen is not uncommon (see Fig. 7). This type of corrosion is termed "concentration - cell" corrosion because it results from the electrochemical potential set up by differences in oxygen concentration within and outside the pit. The oxygen-starved pit area becomes the anode and corrodes rapidly.

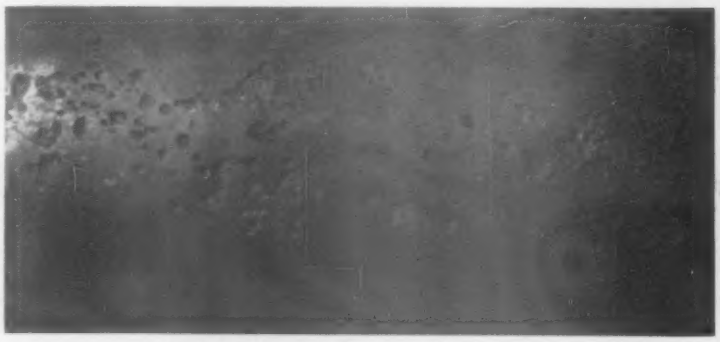
Pitting corrosion often begins during out-of-service periods because stagnation of solution fosters the nonuniformities of environment which promote pitting. Nonuniformities at the metal surface such as defects, scale, deposits, breaks in protective layers, grain boundaries or inclusions are among the metal factors which help cause pitting corrosion. Solutions containing chlorides cause pitting of the stainless steels because these ions have the ability to penetrate or destroy the surface film locally with the formation of corrosion cells.

The relative pitting of various stainless steels in 10 per cent ferric chloride in laboratory tests is shown in Fig. 8.

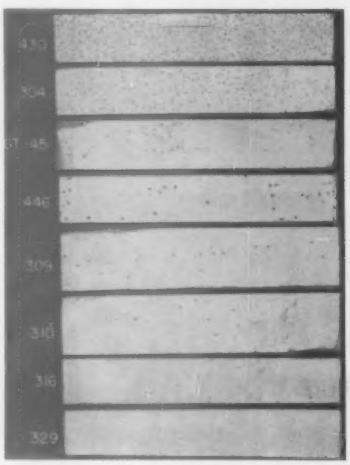
The author is metallurgist, Tubular Products Division, Babcock & Wilcox Co. Article presented at Western Petroleum Refiners Association meeting, Wichita.



IRON SULFIDE scale layers on Croloy 2¼-in. tube. Fig. 6.



OXYGEN cell pits in carbon-steel tubing. Fig. 7.

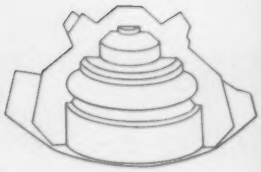


PITTING of various stainless steels in 10 per cent ferric chloride. Fig. 8.

We put the MOST into

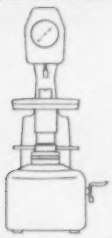
H C Smith ROCK BITS

to make them the BEST!



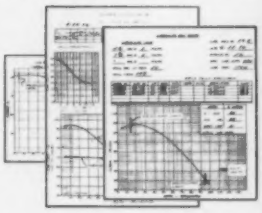
DESIGN

Thousands of hours of design engineering, based on field tests and reports, take in every detail of an H. C. Smith Bit. Tooth design—angle, thickness, shape, spacing—bearings and races, cone shape and structure, bit legs and their stress patterns . . . every part has been designed and tested for effective action on bottom and long service life.



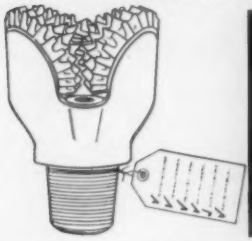
METALLURGY

The field is already familiar with the high standards of H. C. Smith metallurgy—the fact that all our steels are made to our own strict specifications; that every lot is tested by ourselves to be sure that it meets our requirements, and that our forging process is controlled to maintain maximum strength in all parts.



HEAT TREATMENT

The H. C. Smith system of heat treatment control is the most rigid and accurate in the industry. By putting standard samples of every heat of steel through our regular heat treating cycle before parts are made, the reactions of every lot are pre-determined—the hardness and carburization of every part of a Smith Bit is a known factor even before manufacture.



INSPECTION

The careful records kept on the heat treatment of every lot is only one step in the systematic inspection of all parts that go into an H. C. Smith Bit. The long service life of H. C. Smith bits in the field, reported by literally hundreds of good drillers, is the best testimony to the fact that our inspection system doesn't let a faulty bit part get out of the plant.

and the service your H. C. Smith man gives you is final proof that "You'll do better with H. C. Smith Bits!"

-every bit the best

H C Smith OIL TOOL CO.

GENERAL OFFICES, EXPORT OFFICES AND PLANT: COMPTON, CALIF.

BRANCHES IN ALL PRINCIPAL OIL CENTERS IN THE UNITED STATES AND CANADA

Among the

Drilling Contractors

W. J. WEAVER

J. H. MARSEE

W. E. STRITTMATTER

Loffland Expansion Brings Personnel Changes

LOFFLAND BROTHERS CO., Tulsa-headquartering contract-drilling company, is completing a succession of changes in its organizational setup that involve not only a long list of promotions and shifts of present key personnel but also several additions to its staff and expansion of company activity.

Staff additions announced by R. W. Wire, president, include:

Jack H. Marsee, previously division rig superintendent in West Texas for Phillips Petroleum Co., appointed chief engineer.

W. E. Strittmatter, previously general office manager and chief accountant of Mid-Continent Supply Co., Fort Worth, appointed administrative manager, finance and accounting.

John L. Cash, previously associated with several major trucking contractors, appointed head of the company's newly established traffic department.

Shifts in present key personnel are:

R. F. McElhany, formerly secretary-treasurer, becomes manager of the newly formed personnel department. He will continue to direct the company's insurance department.

W. J. Weaver, director of purchases and assistant secretary-treasurer for several years, succeeds McElhany as secretary-treasurer. He will continue his supervision of the purchasing department.

Dale Murphy, assistant chief accountant, elevated to chief accountant.

Marshall Underwood, accountant in the department since joining the company in 1951, succeeds Murphy as assistant chief accountant.

D. D. Thornbury, assistant purchasing agent, promoted to purchasing agent.

John W. Trenary, field clerk for several years in the Rocky Mountain and West Texas division, succeeds Thornbury as assistant purchasing agent.

Thornbury, a graduate of the University of Alabama with a degree in mechanical engineering, joined the Loffland organization in 1952 after several years' experience in oil-field sales. Trenary, who hails from Danville, Ill., is a graduate of Illinois Wesleyan University.

Marsee, the newly appointed chief engineer, is a 1943 graduate of the University of Oklahoma with an engineering degree. He served with the Army Engineering Corps, both in the European and Pacific theaters, until January 1946. Since then, he has been with Phillips Petroleum Co.'s drilling department.

Strittmatter, administrative manager of finance and accounting, has had 11 years' experience in treasury and accounting work since attending Texas Christian University at Fort Worth. Both Murphy and Underwood, who received promotions in the accounting department, are graduates of Oklahoma A. & M. College, Stillwater. Murphy earned his "CPA" in 1951. Underwood joined the company in 1951.

Wheless Drilling Co., Shreveport, has taken a contract for a 9,000-ft. well in Colquitt field, in Claiborne Parish, North Louisiana. It will be drilled for Union Producing Co. off the south side of the field to test the

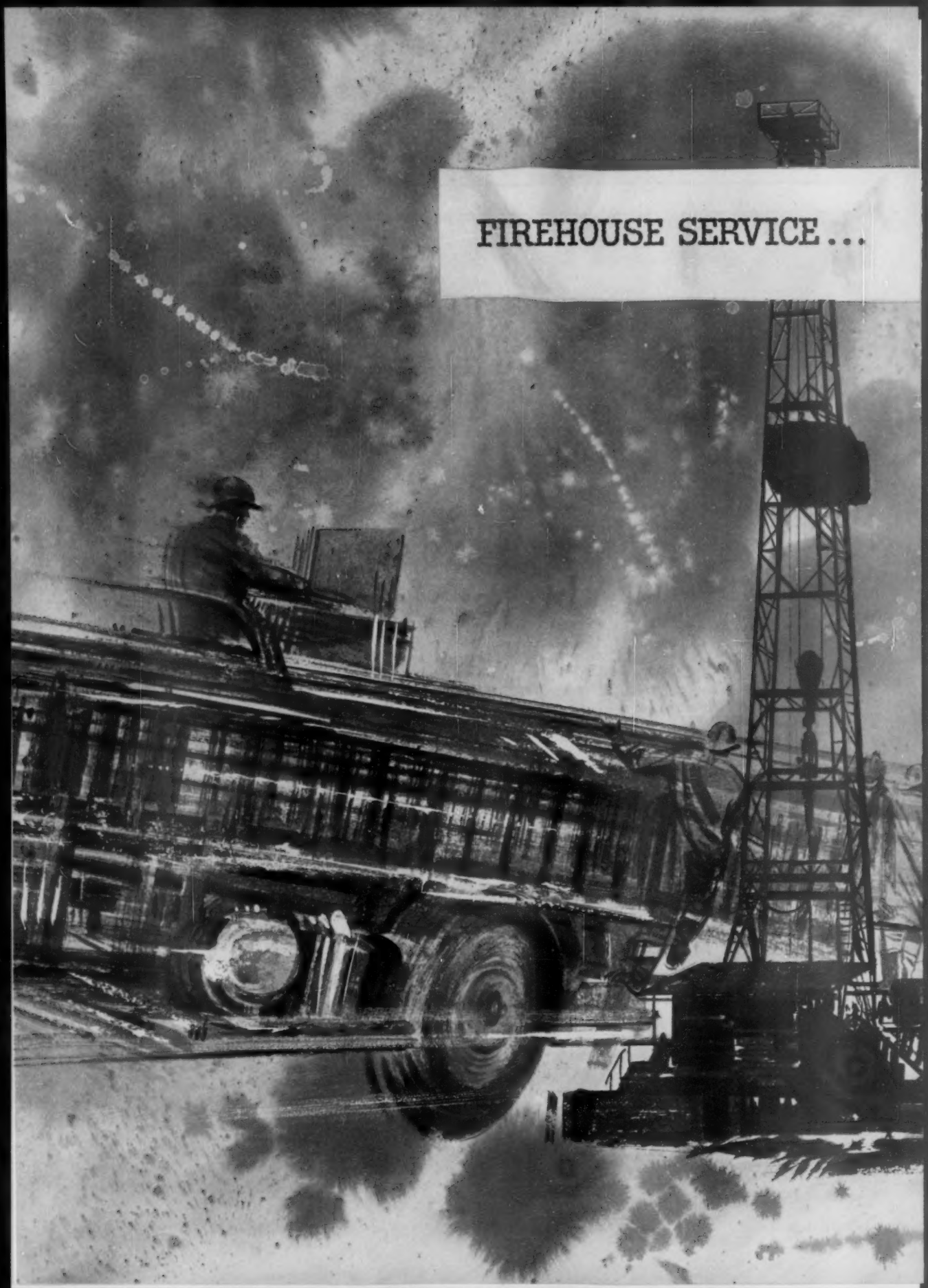
INSURANCE AGAINST WASHOUTS

If mud gets to your joint threads, it can wash out a string in a hurry. 'Bestolife Lead Seal Tool Joint and Casing Compound gives maximum, tight joint make-up, keeps mud out. Standard of the oil country for over twenty-five years. Unconditionally guaranteed. Packed in 1¼, 5, 20 and 50 lb. containers. Sold by leading supply houses throughout the world.

NOW BUYS MUDWONDER

Lynn D. Durham of Durham Drilling Co. now buys Mudwonder Mudline Valves to cut operating costs.

Edward Valves, Inc., Subsidiary of Rockwell Manufacturing Company, East Chicago, Ind.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WHEN AND WHERE YOU NEED IT !

Johnston is tops in testing

and here's why

Johnston realized long ago that just to develop the world's best drill stem tester wasn't enough. Sure, the Johnston Tester is the most dependable way to evaluate a formation, short of a permanent completion. Granted, that the Tension Type Pressure Recorder perfected by Johnston is the most sensitive, the most accurate by far (5/100 of 1%). What if Johnston's development program *is* backed by one of the largest, most respected, independent research groups in the business!

To make Johnston "tops in testing" we also attached great importance to (1) putting our tools only in the hands of carefully trained testers, and (2) getting the tools and the tester to the well location as quickly as possible to prevent the waste of your rig time.

There is a difference in drill stem testing . . . and Johnston makes the difference. Let us show you.

JOHNSTON TESTERS

first in drill JOHNSTON **stem testing**

A Subsidiary of Schlumberger Well Surveying Corporation

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HOUSTON, TEXAS
LOS ANGELES, CALIF.
CALGARY, CAN.

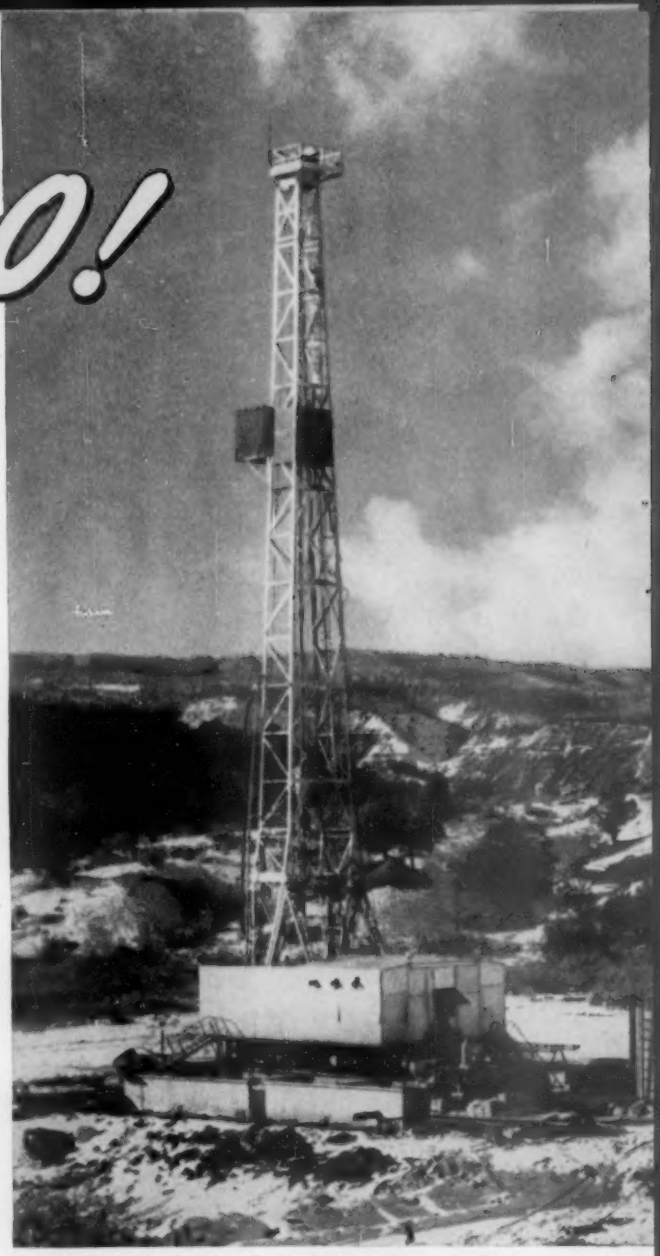
Now a Big 60!

One of the most familiar signs of oil-country activity is the Bethlehem Supply store. Its presence in an oil town is a sure symbol that things are moving fast.

Less than twenty years ago, Bethlehem Supply stores were few and far between. But they're a big family now — a family of 60 units, with more to come. They are in every active field in the western two-thirds of the nation. They cover a vast region extending from Canada to the Gulf Coast; from California to the Mississippi and beyond.

Each of these stores is set up to meet the specialized needs of the area served. Where drilling is predominant in a given field, the Bethlehem store is equipped and stocked accordingly. Likewise, wherever production is active, the store has evèrything needed in pumping and pipe-line supplies. In refinery areas, stocks and services again reflect the demands of local activities.

"Localized" service is a Bethlehem strong point. This means, of course, that every Bethlehem store has a character of its own. But in one respect, all 60 are alike: they're friendly places, run by friendly people. You'll always find a welcome there. Come in and see!



Near Farmington, N. M. A fine Bethlehem store serves this area.

In the Williston Basin. There's a Bethlehem store close by, at Tioga, N. D.

The Gulf Coast. Bethlehem stores down here are as active as the region itself.

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General Offices: 21 E. Second St., Tulsa, Okla.

BETHLEHEM STEEL

West Coast Headquarters: Los Angeles, Calif.

Export Distributor: Bethlehem Steel Export Corporation 25 Broadway, New York, N. Y.

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"SCOT" FORGED SEAMLESS RING GASKETS

MINIMUM HARDNESS

For ring groove flanges forged from reforging billets in all stainless, chrome, monel, copper, extra low carbon steel. Machined in all A.P.I.-A.S.A., special sizes, and other types.

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Write or Wire for Monthly Stock Lists

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Peerless Supply Co., Inc.
L. D. 75 & 76 P. O. Drawer 36-A
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GERONIMO
DERRICK ESCAPE MECHANISM
FOR THE SAFETY OF YOUR DERRICKMEN
sold through your supply store
MANUFACTURED BY:
THE CHARLES MACHINE WORKS, PERRY, OKLAHOMA

Cotton Valley-Taylor sand found productive of gas and condensate in a well completed last July by Crow Drilling & Producing Co. The latter well extended the field 1¼ miles south with pay at 8,927-37 ft. Wheless' job, 1 Tiger Unit, in 33-23n-6w, is ¼ mile farther south.

Dallas Contractor Enters Western Canada Operation

Gardner Brothers Drilling Co., Dallas, has moved one of its larger rotary rigs from the United States to Alberta Province, western Canada, where it will be operated by the company's newly formed Canadian subsidiary, Gardner Brothers Drilling Co., Ltd. Headquarters office for the new Canadian company is at Calgary under management of D. S. Kirklin.

The rig, a National 75, is under contract to British American Oil Co., Ltd., for its first job in Canada, located 65 miles northwest of Calgary at the company's 11-11 Kevisville, in LSD 11, 11-35-4w5.

Big Chief Expands Safety

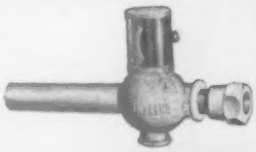
Big Chief Drilling Co., Oklahoma City, has shifted Harold Young from its accounting and operations department to the safety and personnel division, where he will be assistant to Bob Dalgleish, director. There he will be responsible for safety meetings in the company's drilling and production department, and serve as personnel contact man between the Oklahoma City office and field operations.

Montgomery Drilling Co., El Dorado, Ark., has a rig under contract to Murphy Corp. and Sun Oil Co. for another Tuscaloosa test at Turkey Creek, in Franklin County, northeastern Louisiana. It is a 4,650-ft. job at 1-E Holt, in 9-15n-8e, on the north side of the field.

Sterling Drilling Co., Sterling, Kans., is drilling for Tennessee Gas Transmission Co. at a wildcat location 18 miles south of Meade, in southern Meade County, southwestern Kansas. It is a 6,400-ft. contract job. Location is listed as 1 Dickey, spotted in 12-35s-28w. It is about 5 miles west of Fincham gas field.

Ruhl Drilling Co., Houston, has another Cotton Valley operation in Sligo field, Bossier Parish, northwestern Louisiana, where it is drilling on contract for Union Producing Co. Work now is getting under way at Union's 2 Section 13 Unit, in 13-17n-12w, about ¾ mile west of nearest well. Contract depth is about 8,300 ft.

MORE HORSEPOWER



WITH INFERNO OIL BURNER

The primary air serves the same purpose as does the oxygen in an acetylene torch . . . to make a hotter fire. Maintaining this hotter fire makes it possible to secure 10% to 20% more horsepower from the same boiler. Write for Bulletin No. 36.

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FOR CHARTER STEEL BARGES

"For Oil Field Service"

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HUNDREDS OF JOBS IN TWO YEARS PROVE . . .

CEALM

DOWELL

MOST EFFECTIVE CEMENTING SERVICE IN THE OIL INDUSTRY . . . USES LATEX-CEMENT SLURRY

Dowell Developed Cealment

Cealment*—the first really new cementing service in 20 years—was developed and introduced by Dowell in 1955 to answer cementing problems plaguing oil operators everywhere.

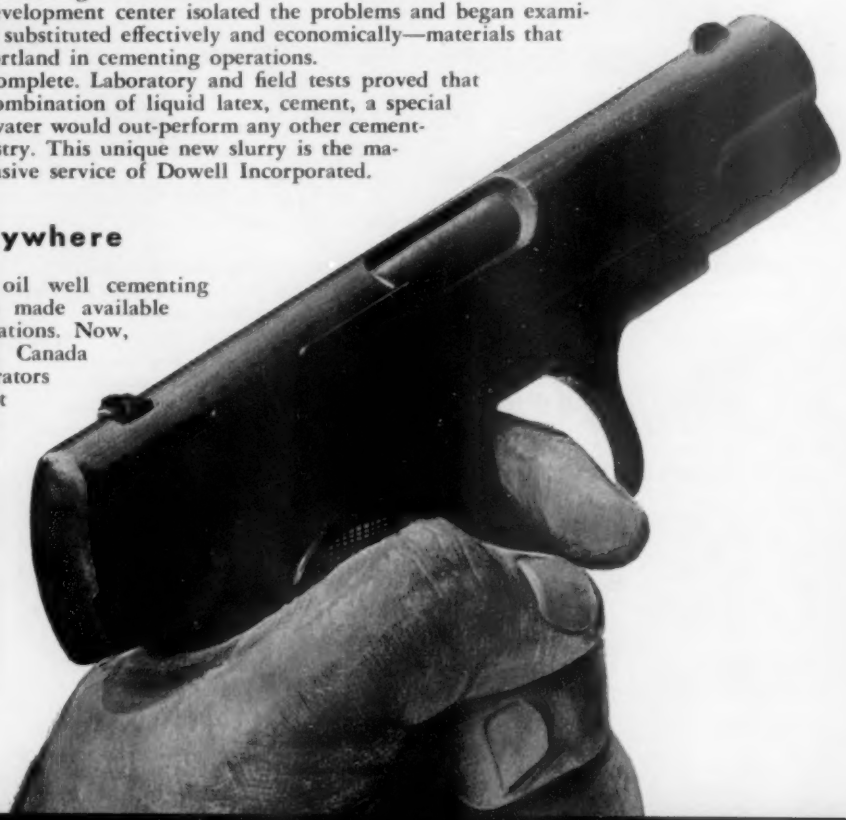
For years it had become increasingly apparent that common Portland cement could not always be depended upon to provide a satisfactory cement job. Regular cement was showing high fluid loss and a high shrinkage factor. As perforating became more practical, common Portland cementing became more impractical, shattering and breaking down under stress.

The Dowell research and development center isolated the problems and began examination of materials that could be substituted effectively and economically—materials that would give service superior to Portland in cementing operations.

By early 1955 the job was complete. Laboratory and field tests proved that a slurry containing the proper combination of liquid latex, cement, a special Dowell surface-active agent and water would out-perform any other cementing material offered the oil industry. This unique new slurry is the material used in Cealment, an exclusive service of Dowell Incorporated.

Available Everywhere

Cealment, Dowell's specialized oil well cementing service using latex-cement, was made available in 1955 to all areas of oil operations. Now, throughout the United States, Canada and Venezuela—wherever oil operators want it Dowell provides Cealment service. Trained crews with hundreds of jobs and a proved product behind them are available from any of the nearby 165 Dowell offices and stations. Call Dowell and ask for Cealment on your next cement job.



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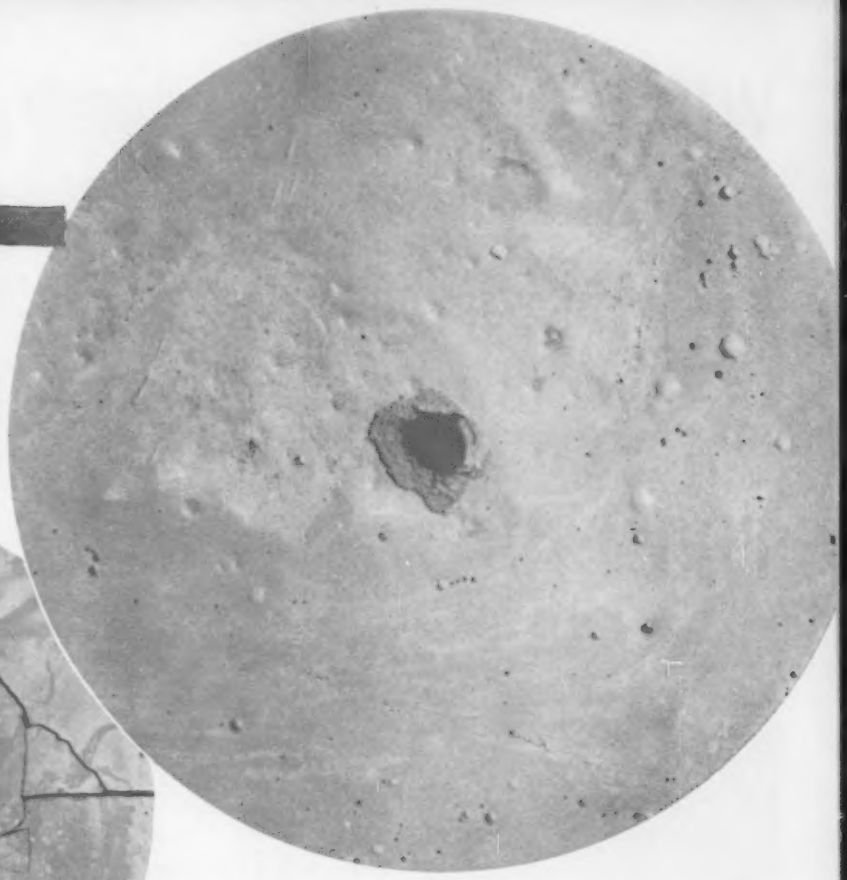

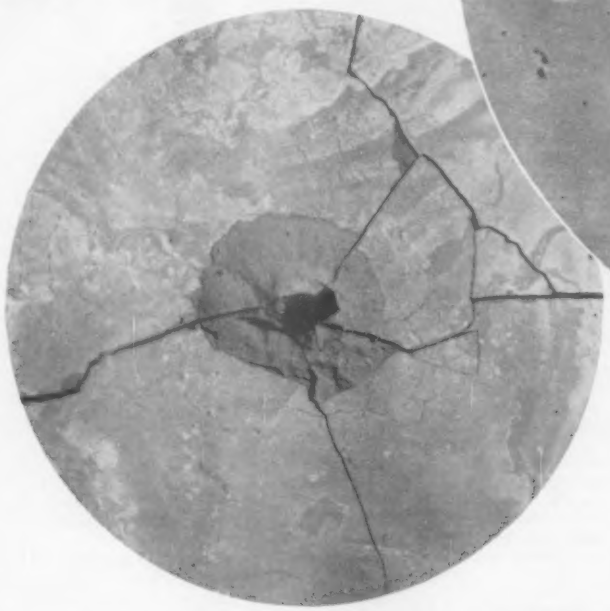

These samples were shot with a 38-caliber automatic. The latex-cement disk above was pierced without shattering. The disk at left is common Portland cement after receiving the same treatment.

DEPENDABLE FOR TOUGH JOBS

Cealment has provided successful results in cementing jobs —even under the most difficult conditions. It can be used any place regular Portland is now being used. It has proved especially useful for setting liners, squeezing, setting long string, tailing-in on long string and repairing holes in casing. With Cealment you save money, because this Dowell service helps you avoid unnecessary squeeze jobs and costly return trips.

LOW SHRINKAGE—Latex-cement does not shrink when set under pressure.

SUPERIOR BONDING—Bonding strength between the formation and the casing—whether in oil or water—is superior with Cealment.

GREATER RESILIENCY—Resists shattering when perforated. Affords little danger of intrusion of water from below or gas from above.

LOW FLUID LOSS—Permits low water content. Practically eliminates danger of incomplete shut-off due to shrinkage and flash-setting due to dehydration.

PERMANENCY—Cealment has extra resistance to sulphate brines without sloughing—provides durability.

RESISTANCE TO CONTAMINATION—Cealment assures better resistance to any acid or other well fluids that may be introduced later into a perforated zone.

Consult your Dowell representative for specific recommendations; in Venezuela, contact United Oilwell Service. Or write Dowell Incoporated, Tulsa 1, Oklahoma.

*Service Mark of Dowell Incorporated

NEW in 1955 — PROVED Today! Check just a few of the results made possible with Cealment.

DEPTH	PROBLEM	RESULTS
1588'	To prevent water communication on primary cement job.	265 gallons Cealment. Perforated and fractured; made 30 BOD, no water.
1900'	To set liner and isolate water.	975 gallons Cealment. Liner held. Fractured successfully.
2300'	Squeeze hole in casing after three previous squeeze jobs.	500 gallons Cealment. Hole repaired.
6355'	To squeeze channel for water shut-off, for re-completion.	500 gallons Cealment. Channel repaired.
4059'	To regain lost circulation.	750 gallons Cealment. Drilled out Cealment. Regained circulation and continued drilling.
4660'	Tail-in behind primary cement job.	275 gallons Cealment. Producing zones successfully isolated.

Services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

WHAT WILL YOUR PIPE LINES LOOK LIKE 10 YEARS FROM NOW ?

In case after case, lines protected with TAPECOAT have been dug up after more than 10 years of service *with no signs of deterioration on the pipe surfaces uncovered.* That's why TAPECOAT coal tar coating is specified by those who realize that continuing protection is the *first* consideration.

Since 1941, this quality coal tar coating in handy tape form has demonstrated its ability to withstand corrosion year after year, above and below ground, on pipe, pipe joints, couplings and other vulnerable surfaces.

Why gamble with "unknown" protection? By using TAPECOAT, you'll be sure to have the quality protection you need for long service life without costly maintenance and replacement.

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Pipeline Patrol

. . . Report on Construction

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way. Uncontracted projects are indicated by • preceding the project.

Crude-Oil Pipelines

• **Cape Pipe Line Co.** (organized by Sun Oil Co., Cities Service Co., Atlantic Refining Co.)

Project: Long range plans for line on the lower Delaware Bay to the Philadelphia refining area.

Completion: 1960.

• **Four-Corners Pipe Line Co.** (newly formed by Shell Oil Co., Standard Oil Co. of California, Continental Pipe Line Co., Gulf Oil Corp., Richfield Oil Corp., Superior Oil Co.)

Project: 600 miles of line from near Farmington, N. Mex., in the Four Corners area to Los Angeles, to be constructed and operated by Shell Pipe Line Corp. as agent for the companies.

Status: Construction to start in April. Preliminary engineering work under way.

Fulton, R. H. & Co., Lubbock, Tex.

Project: 39 miles of 6-in. from Donkey Creek field in northeastern Wyoming, southeast to the Osage pump station in Weston County.

Status: Fulton, a contractor has applied to Wyoming Public Service Commission.

• **Interstate Oil Pipe Line Co.**

Project: 5 miles of 4-in. from South Bosco field, Louisiana, to present main line, and 5 miles of various size from Church Point field, Louisiana, to present main line.

Status: Proposed.

• **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest)

Project 80 miles of 8-in. and 300 miles of 10-in. crude and products line from Four Corners area to Salt Lake City.

Status: To start May 1957.

Completion: August 1957.

• **Offshore Gathering Corp.,** Houston.

Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana. (Dual line.)

Status: Proposed.

• **Pasotex Pipe Line Co.**

Project: 127 miles of 20-in. along its route from Wink to El Paso, retiring another dual 8-in. section.

Status: Under way.

Completion: July 1. 1957.

• **Shamrock Oil & Gas Corp.**

Project: 35 miles of 6-in. to serve fields in Ochiltree and Hansford counties in the Texas Panhandle.

Status: Plans to start building in March or April 1957.

• **Sinclair Pipeline Co.**

Project: 150 miles of 20-in. from Teague, Tex., to Houston.

Status: Planned for 1958.

Completion: 1958.

• **Tecumseh Pipe Line System** (Joint venture of Sinclair Pipe Line, Ashland Oil & Refining, and Pure Oil Co.)

Project: 190 miles of 20-in. between Griffith, Ind., and Cygnet, Ohio.

Status: Under way.

Completion: September 1957.

• **Texas-New Mexico Pipe Line Co.** (owned by The Texas Co., Sinclair Pipe Line Co., Tidewater Oil Co., and Empire Gas & Fuel Co.)

Project: 515 miles of 16-in. from southeast corner of Utah to Jal in southeastern New Mexico.

Status: Field surveys began January 1957.

Union Oil Co. of California.

Project: 45 miles of 12-in. and 180 miles of 16-in. crude and products line from San Joaquin Valley to its Oleum refinery at Rodeo, Calif.

Status: Under way.

Contractor: **Roy Price, Inc.**

Completion: April 1, 1957.

Products Pipelines

• **American Pipe Line Co.**

Project: Line from Gulf Coast to New York City area. Received ODM approval to amortize 40 per cent of $175,000,000 cost with a rapid writeoff.

Status: Proposed.

Buckeye Pipe Line Co.

Project: Conversion of 116 miles of 8-in. crude to products between Huntington, Ind., and Griffith, Ind.

Status: Planned.

Contractor: **Sheehan Pipe Line Construction Co.,** C. M. Brown, superintendent, office at Rochester, Ind.

Completion: Fall 1957.

Project: Conversion of 32 miles of 8-in. crude to products between Mantua, Ohio, and Youngstown area.

Status: Planned.

Contractor: Company will do own work.

Completion: November 1957.

• **Cities Service Pipe Line Co.**

Project: 27 miles of 6-in. ethylene line from Lake Charles, La., to Orange, Tex.

Status: Planned.

Completion: April 30, 1957.

• **Continental Pipe Line Co.**

Project: Conversion of 99 miles of 6-in. from the Wichita Falls area to near Fort Worth, Tex., plus a 15-mile extension of the line to the Grapevine area northeast of Fort Worth.

Status: Conversion under way. Extension planned.

• **El Paso Natural Gas Co.**

Project: 11 miles of 4-in. L.P.G. products from Snyder Line to South Andrews Plant, Texas.

Status: Planned.

• **Great Lakes Pipe Line Co.**

Project: 84 miles of 8-in. from south of St. Paul to Eau Claire, Wis.; 68 miles of 12-in. from Great Lakes intersecting point with Badger Pipe Line to Chicago.

Status: Construction scheduled to start spring 1957.

• **Gulf Refining Co.**

Project: 530 miles of 10-in. L.P.G. and natural gasoline line from Waddell Plant in Crane County, Texas, to Mont Belview near Houston (368 miles is conversion from crude service).

Status: Under way.

Contractor: **Panama-Williams Corp.** has 46 miles from Waddell Plant to Midland. Remainder not let.

Gulf Refining Co.

Project: 90 miles of 6 to 8-in. from Eunice,

Pipeline Patrol

N. M., plant to move raw products to West Texas-Gulf Coast line at Midland.
Status: Under way.
Contractor: **Eastern Pipeline Contractors,** Dallas.
Completion: April 1957.

- **Interstate Oil Pipe Line Co.**

Project: Four 38-mile lines from the Esso Standard Oil Co. refinery at Baton Rouge to Sorrento, La.: two 4-in. lines; one 6-in. line; one 8-in. line. Lines will carry ethylene, butane, and propane.
Status: Under way.
Contractor: **Fowler-Tatom Pipeline Contractor.**
Completion: April 1, 1957.

- **Laurel Pipeline Co.** (Gulf Refining Co. and Sinclair Pipe Line Co.)

Project: A 24-in. line from the Philadelphia refining area to Cleveland.
Status: Under consideration.

- **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest)

Project: 80 miles of 8-in. and 300 miles of 10-in. products and crude line from Four Corners area to Salt Lake City.
Status: To start May 1957.
Completion: August 1957.

- **Ohio Oil Co.**

Project: 350-miles of 12-in. from Wood River, Ill., to Chicago.
Status: Work to start fall 1957.
Completion: 1958.

- **Southern Pacific Pipe Lines, Inc.**

Project: 100 miles of 10-in., 80 miles of 8-in., and 125 miles of 6-in. between Richmond, Calif., and Fallon, Nev.
Status: Under way.
Contractor: **River Construction Corp.** has 84 miles of 8, 10-in. from Richmond to Stockton, Calif. to complete late spring 1957, F. O. Traweek, spread superintendent, office at Richmond. **Hood Construction Co.,** Lynwood, Calif., has 58 miles of 10-in. from Stockton to Roseville, Calif. **Engineers, Limited Pipeline Co.** and **Joe E. Young Pipe Line Construction Co.** have 18 miles of 6 and 8-in. between Roseville and Donner Summit.
Completion: August 1, 1957.

- **Union Oil Co. of California**

Project: 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its proposed Rifle shale-oil plant.
Status: Proposed.

Natural-Gas Pipelines

- **Arkansas Louisiana Gas Co.**

Project: Line from Texas-Louisiana coastal region to northern Louisiana, to connect with their present system.
Status: Long-range plans.

Carolina Pipeline Co.
Project: 177 miles of 2, 3, 4, 6, 8, and 10-in. between Blacksburg and Camden, S. C.
Status: Work to start June 1, 1957. Has FPC examiner's approval.
Contractor: **Panama-Williams Corp.**

Cities Service Gas Co.
Project: 8 miles of 16-in., 20 miles of 8-in., 20 miles of 6-in., and 20 miles of 4-in. field lines in Barber County, Kansas.
Status: Approved. Under way.
Contractor: **Vaughn & Taylor Construction Co.**
Project: 3 miles of 12-in., 8 miles of 10-in., 4 miles of 8-in., 8 miles of 6-in., and 37 miles of 4-in. field lines in Eureka Field, Okla.
Status: Approved. Under way.
Contractor: **Vaughn & Taylor Construction Co.**
Project: 4 miles of 16-in. at Sarcoxie, Mo.
Status: Approved. Under way.
Contractor: **Prairie Construction Co.**

- **Cities Service Pipe Line Co.**

Project. 64 miles of 6 to 30-in. in Leaven-

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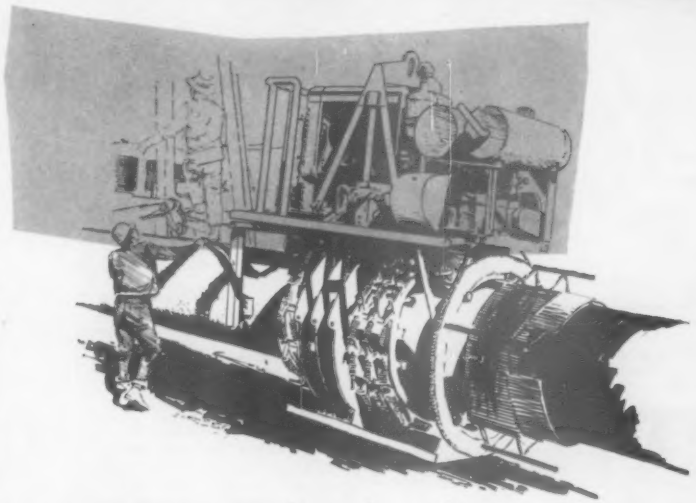

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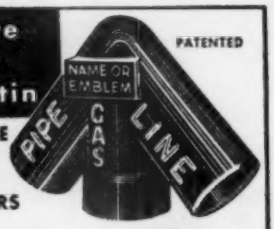

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Pipeline Patrol

worth and Anderson counties, Kansas, Cass County, Missouri. and Oklahoma County, Oklahoma.

Status: Planned.

- **Coastal Transmission Corp.**

Project: 575 miles of 12, 20, 22, 24-in. main line and 414 miles of 2 to 14-in. gathering lines between McAllen, Tex., and Baton Rouge, La.

Status: Has conditional FPC approval.

Completion: January 1, 1958.

- **Colonial Natural Gas Corp.**

Project: Two systems; one between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.

Status: Proposed.

- **Colorado Interstate Gas Co.**

Project: 1957 program . . . 66 miles of 30-in., 40 miles of 34-in., 109 miles of 26-in., and 100 miles of 24-in. from Springfield, Colo., to Pueblo, Colo; 345 miles of 30-in. from Kit Carson, Colo., to Beatrice, Neb.; 50 miles of 22-in. from Laverne to Hooker, Okla.; 24 miles of 22-in. Panhandle field looping.

Status: Pending FPC approval.

Project: 139 miles of 4 to 24-in. from Mocane to Hooker, Okla.

Status: Planned.

Contractor: **Panama, Inc.** Spread offices will be at Beaver City and at Mocane, Okla.

Completion: May 15, 1957.

- **El Paso Natural Gas Co.**

Project: 338 miles of 34-in. from San Juan and Permian basins to California border.

Status: Under way.

Contractor: **R. H. Fulton Co.** has 102 miles; **Western Pipeline, Inc.,** has 144 miles; El Paso will construct remaining 92 miles.

Completion: April 1957.

Project: 83 miles of 34-in. from San Juan and Permian basins to California border, plus about 800 miles of gathering lines.

Status: Planned.

- **Houston Texas Gas & Oil Corp.**

Project: 943 miles of 26-in. between Baton Rouge, La., and Miami, Fla., plus 682 miles of sales laterals in Florida, with main line joining Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.

Status. Has conditional FPC approval.

- **Iron Ranges Natural Gas Co., St. Paul.**

Project: 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minn.

Status: Application pending with FPC.

- **Kansas-Nebraska Natural Gas Co.**

Project: 61 miles of various size gathering line in Camerick field, Texas County, Oklahoma.

Status: Approved.

Project: 10 miles of 10-in. between Grand Island and Fullerton, Nebr.

Status: Approved.

Completion: May 1, 1957.

Project: 12 miles of 12-in. between Scott City and Colby, Kans.

Status: Approved.

Completion: May 1, 1957.

Michigan Consolidated Gas Co.

Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.

Status: Under way.

Contractor: **Somerville Construction Co.;** Floyd Huduall, spread superintendent, office at Cadillac, Mich.

Project: 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich.

Status: Under way.

Contractor: **Somerville Construction Co.,** jointly with **J. L. Gentry Construction; Frank** Morris, spread superintendent, office at Hart, Mich.

- **Michigan Wisconsin Pipe Line Co.**

Project: 24 miles of 24-in. and 16 miles of 4-in. looping in Michigan, Indiana, Illinois, Wisconsin, Iowa, and Missouri.

Status: Approved.

Completion: 1957.

- **Midwestern Gas Transmission Co.**

Project: Will build main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in., 648 miles of 3 to 18-in. extensions in Minnesota and Wisconsin.

Status: Application pending with FPC.

- **Mountain Fuel Supply Co., Salt Lake City.**

Project: 38 miles of line to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.

Status: Has temporary FPC permit.

- **Natural Gas Pipeline Co. of America**

Project: 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex.

Status: Has FPC approval.

Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and for 91 miles of 30-in. loops along parts of its main line.

Status: Application pending with FPC.

- **North Carolina Natural Gas Corp.** (Subsidary of Colonial Natural Gas Corp.)

Project: 575 miles of 3 to 16-in. from Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across north Carolina.

Status: Has permit from North Carolina Utilities Commission.

- **Northern Natural Gas Co.**

Project: 160 miles of 2, 3, 6, 8-in. branch lines to serve 20 new communities on Aberdeen, S. D., line.

Status: Under way.

Contractor: **Troth Construction Co.**

Project: 73 miles of 20-in. from Savana Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.

Status: Planned.

- **Offshore Gathering Corp.,** Houston.

Project: 364 miles in Gulf of Mexico off Louisiana.; 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in. (Dual line.)

Status: Application pending with FPC.

- **Ohio Fuel Gas Co.**

Project: 7 miles of 12-in. near Fremont, Ohio.

Status: Planned.

Completion: First half 1957.

Project: 23 miles of 18, 20-in. from Gibsonburg to Toledo.

Status: Uncertain.

Project: 152 miles of line in Ohio: 38 miles of 24-in. from Crawford Station to Utica; 18 miles of 24-in. from Pavonia Station to Line D; 6 miles of 20-in. from Mount Gilead to Claridon; 4 miles of 20-in. near Dayton; 4 miles of 20-in. near South Charleston; 7 miles of 16-in. near Springfield; 6 miles of 20-in. nnear Oberlin; 17 miles of 20-in. from Oak Hill to Symmes Station; 7 miles of 12-in. from Mount Sterling to Bloomingburg; 2 miles of 8-in. near Bellefontaine; 3 miles of 12-in. near Mansfield; 4 miles of 12-in. near Lakeville; 7 miles of 8-in. in Guernsey and Belmont counties.

Status: Planned.

Completion: Second half 1957.

- **Pacific Gas & Electric Co.**

Project: 37 miles of 20-in., 37 miles of 18-in., 9 miles of 12-in. from Beehive Bend field near Willows, Calif., to near Davis, then to Sacramento.

Status: Under way.

Contractor: **Engineers Limited Pipeline Co.**

Project: 138 miles of 34-in. looping of the Topock-Milpitas line.

Status: Under way.

Contractor: A joint-venture firm, **Midwestern-Johnson-Dixon,** has completed 65 miles.

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Pipeline Patrol

Completion: 73 miles to be completed in 1957.

Project: 200 miles of 12-in. from Sacramento Valley gas fields to Humboldt County, California.

Status: Has filed for approval of California's Public Utilities Commission. To start early 1957.

Completion: December 1, 1957.

• **Pacific Northwest Pipeline Corp.**

Project: 37 miles of 6-in. from Dove Creek to Nucla, Colo., and 13 miles of 4-in. from Nucla to Urvan, to serve Union Carbide Nuclear Co. and Vanadium Corp. of America.

Status: Has FPC permit.

Project: 1,000 miles of gathering lines and laterals along present line.

Status: Planned.

Completion: 1957.

• **Peoples Natural Gas Co.**

Project: 8 miles of 8-in. between Claysburg and Hollidaysburg, Pa.

Status: Planned.

Completion: August 1957.

• **Permian Basin Pipeline Co.**

Project: 83 miles of 16-in. from its Spraberry station in Midland County, Texas, to tie in with Pioneer Gathering System, Inc., at a point in northwestern Schleicher County, Texas.

Status: Filed for FPC approval.

• **Piedmont Gas Co.,** Hickory, N. C. (Parent is Carolina Natural Gas Corp.)

Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.

Status: Application pending with FPC.

• **Pioneer Gathering System, Inc.**

Project: 27 miles of 16-in. and 27 miles of 12-in. in Schleicher and Sutton counties, Texas.

Status: Filed for FPC approval. Estimate to start work March 1, 1957.

Completion: July or August 1957.

Southern California Gas Co. and Southern Counties Gas Co. of California.

Project: 241 miles of 30-in. from the outskirts of Los Angeles to Topock on the Arizona-California border.

Status: Under way.

Contractor: **R. H. Fulton & Co.**

Completion: June 30, 1957.

• **Southern Natural Gas Co.**

Project: 5 miles of 8-in. laterals in Napoleonville Field, La.

Status: Pending FPC approval.

Completion: December 1, 1957.

Project: 5 miles of 8-in. between Fort Jackson and Olga, La.; 32 miles of 6-in. from Chandeleur Sound area, Breton Island, La.; 7 miles of 8-in. and 5 miles of 10-in. from Main Pass area to Olga, La.; 9 miles of 8-in. from Bastian Bay Field to Fort Jackson Field; 7 miles of 8-in. laterals in Manila Village Field.

Status: Plan to apply for FPC permit.

Completion: December 1, 1957.

Spokane Natural Gas Co.

Project: 400 miles of 1 through 24-in. distribution system at Spokane.

Status: Under way.

Contractor: **Hallmac Construction Co.;** V. L. Williams, spread superintendent, office at Spokane.

Completion: 1957.

• **Tennessee Gas Transmission Co.**

Project: 221 miles of 30-in., 101 miles of 26-in., and 10 miles of 24-in. looping from Portland, Tenn., to Greenup, Ky.; from Morehead, Ky., to Catlettsburg, Ky.; from Catlettsburg to Broad Run, W. Va.; from New Wilmington, Pa., to Mercer, Pa.; and from New Castle, Pa., to near Pittsburgh, Pa.

Status: Pending FPC approval.

Project: 51 miles of 26-in., 51 miles of 20-in., and 17 miles of 12-in. gathering lines from Kinder, La., to offshore fields in Gulf of Mexico.

Status: Pending FPC approval.

Project: 577 miles of 30-in. from Mississippi River delta area south of New Orleans to Portland, Tenn.

Status: Pending FPC approval.

Project: 76 miles of 24-in. between Coudersport, Pa., and Hamburg, N. Y.

Status: Pending FPC approval.

• **Texas Eastern Transmission Co.**

Project: 422 miles of 30-in. from near McAllen to Beaumont, Tex., to move imported Mexican gas; 45 miles of 24-in. laterals from McAllen to Provident City, Tex., 77 miles of 30-in. looping between Kosciusko, Miss., and Uniontown, Pa.; 147 miles of supply and sales laterals.

Status: Under way.

Contractor: **Houston Contracting Co.** has 121 miles of 30-in. between Angleton and Vidor, Tex., to start March 1, 1957. **H. C. Price Co.** has 70 miles of 30-in. **H. B. Zachry Co.** has 201 miles of 30-in. starting near McAllen and running northeast to near Angleton, Tex. **Grayco Constructors, Inc.** has 45 miles of 24-in. laterals from Blessing to Provident City. **Western Pipe Line, Inc.,** Austin, has 30-in. crossings at Nueces, Lavaca, and Carancahua bays. **Missouri Valley Dredging Co.,** Omaha, has crossings at Hinds and Guadalupe bays. **Altgelt Construction Co., Inc.,** has 100 miles of 3, 4, 6, 8-in. gathering lines in the Corpus Christi area.

Completion: Fall 1957.

Project: 17 miles of 8-in. and 3 miles of 6-in. from its 20-in. Baytown-Hankamer line to Alco-Mag field in Harris County, Texas.

Status: Has FPC approval.

• **Texas Illinois Natural Gas Pipeline Co.**

Project: 10 miles of 36-in. to loop existing single 30-in. near Joliet, Ill.

Status: Pending FPC approval.

Texas Power & Light Co.

Project: 58 miles of 8-in. from Groesbeck to Grapeland, Tex.

Status: Under way.

Contractor: **Panama, Inc.,** Gene Coulter, superintendent, office at Buffalo, Tex.

Completion: March 15, 1957.

• **Transcontinental Gas Pipe Line Corp.**

Project: 29 miles of 16-in. laterals to take gas from Block 45 Field offshore Cameron Parish, Louisiana.

Status: Has temporary FPC authority.

Project: 350 miles of line from Louisiana to North Carolina.

Status: Work under way with temporary FPC approval. Awaiting final approval.

United Gas Pipe Line Co.

Project: 48 miles of 20-in. from Deep Lake field to the Lake Charles, La., area.

Status: Under way.

Contractor: **Brown & Root, Inc.**

Foreign Crude-Oil Pipelines

Arabian American Oil Co.

Project: 140 miles of 20-in. from Safaniya field in the Persian Gulf to Ras Tanura, Saudi Arabia, plus an 8-in. gathering system in the gulf.

Status: Under way.

Contractor: **International Bechtel Brothers, Inc.**

Completion: April 1, 1957.

Bolivian Gulf Oil Corp.

Project: 160 miles of 10-in. and 43 miles of 8-in. from Sicascia to Arica on the Chilean coast.

Status: Awaiting pipe.

Contractor: **Williams Brothers Co.**

Completion: December 1957.

• **B-A Alberta Pipe Line, Ltd.**

Project: 35 miles of 8-in. to connect Drumheller field, Alberta, with existing lines running to Edmonton.

Status: Pending approval.

Cia. Shell de Venezuela

Project: 23 miles of 20-in., 5 miles of 16-in., 2 miles of 24-in. from Lake Maracaibo wells to Cabimas, Venezuela.

Status: Under way.

Contractor: **Brown & Root, Inc.**

Completion: April 1957.

• **Colombian Petroleum Co.**

Project: 42 miles of 6-in. from Tibu field to Rio de Oro in Colombia.

Status: Planned.

• **Creole Petroleum Corp.**

Project: 87 miles of 30-in. from Temblador field to Caripito in Venezuela.

Status: Planned.

Completion: 1959.

Project: 9 miles of 26-in. from Ule to La Salina in Venezuela.

Status: Planned.

Completion: Late 1957.

• **Interprovincial Pipe Line Co.**

Project: 151 miles of 20-in. to extend present line from Sarnia to Port Credit, Ont.

Status: To start May 1957.

Completion: September 1957.

Project: 33 miles of 24-in. from Kendal to Peebles, Sask.

Status: To start June 1, 1957.

Contractor: **Fulton-Banister, Ltd.**

Completion: July 31, 1957.

Project: 79 miles of 26-in. from Clearbrook, Minn., to Superior, Wis.

Status: To start June 1, 1957.

Contractor: **R. H. Fulton & Co.**

Completion: August 31, 1957.

• **Iraq Petroleum Co.**

Project: About 600 miles of up to 40-in. from Kirkuk field through Iraq and Turkey to the Turkish port of Iskenderun on the Mediterranean sea.

Status: Proposed. Survey completed.

Israeli Government

Project: 125 miles of 8-in. from Elath to Beersheba.

Status: Under way.

Completion: March or April 1957.

• **Mene Grande Oil Co.**

Project: 11 miles of 6-in. from Elias to Pria, and 10 miles of 10-in. from Limon to Leona-Dacion lateral, Venezuela.

Completion: First quarter 1957.

Project: 59 miles of 30-in. from fields in Eastern Venezuela to Puerto La Cruz.

Status: To start in 1957.

Completion: First quarter 1958.

• **North-West Oil Pipelines Co.** (newly formed by six West German refiners, headed by affiliates of Standard Oil Co. (N.J.), and British Petroleum Co., Ltd.)

Project: 210-mile line from the refining centers in the industrial Ruhr area of West Germany to Wilhelmshaven.

Status: Planned.

Completion: 1959.

Pembina Pipe Line, Ltd.

Project: 100 miles of 3 to 12-in. gathering line in Pembina oil field.

Contractor: **Mannix, Ltd.;** T. Childress, spread superintendent, office at Drayton Valley, Alta.

Completion: Fall 1957.

Rangeland Pipe Line Co.

Project: 48 miles of 12-in. between Sundre and the Sylvan Lake in south-central Alberta.

Status: Under way.

Contractor: **Dutton-Williams Brothers, Ltd.**

Completion: August 1957.

• **Royal Dutch-Shell**

Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, and Netherlands, and Belgium. Main trunk to be 30-in.

Status: Company is considering project together with several other companies.

Sinclair Oil Corp. and Socony Mobil Oil Co.

Project: 211 miles of 20-in. from the Sil-

Pipeline Patrol

vestre field in Barinas, Venezuela, to Puerto Cabello on Caribbean Sea.

Status: Under way.

Contractor: **Williams Brothers Sudamericano, Ltd.**

Completion: July 1957.

- **Royalite Oil Co., Ltd.**

Project: 250 miles of line to move oil from the Athabasca oil sands of northeastern Alberta to Edmonton.

Status: Long range plans.

Completion: 1960.

- **Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie**

Project: Line in Sahara Desert area to move oil from Hassi Massaoud field. Two routes possible: 200 miles from the field northwest to Laghouat; 260 miles from the field to the north and slightly east to Biskra.

Status: Under study.

- **Trans Mountain Oil Pipe Line Co.**

Project: 100 miles of 30-in. loops: 50 miles east of Kamloops, B. C., and 50 miles west of Edson, Alta.

Status: Engineering completed by Canadian Bechtel, Ltd.

Completion: 1957.

Union of Soviet Socialist Republic

Project: 2,300-mile Trans-Siberian crude and products line from Ufa and the Tuimaza fields in Bashkiria to Irkutsk near Lake Baikal.

Status: Under way.

- **Westspur Pipe Line Co.**

Project: 20 miles of 12-in. from Alida in southeastern Saskatchewan, to the Carnduff-Glen Ewen area to tap Cantal, Hastings, Florence, Carnduff, and Glen-Ewen fields; 34 miles of 4, 6, 8-in. gathering lines.

Status: Planned. Has requested permit from Board of Transport Commissioners.

Yacimientos Petrolliferos Fiscales (Argentina)

Project: 932 miles of 12-in. from Campo Duran to San Lorenzo.

Status: Under way.

Contractor: **TECHINT** (Compania Tecnica Internacional), Buenos Aires, has 90 miles.

Project: 497 miles from Mendoza to Buenos Aires.

Status: Proposed.

Foreign Products Pipelines

Hydrocarbons Pipeline Co. (Subsidiary of Canadian Hydrocarbons)

Project: 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Fort William, Ont.

Status: Has permit from Parliament of Canada. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board, work will start early 1957.

Construction consultants: **Dutton-Williams Brothers, Ltd.**, Calgary, and **A. D. Little & Co.**, Boston.

Imperial Oil, Ltd.

Project: 37 miles of 12-in. from Waterdown to North Toronto, Ont.

Status: Under way.

Contractor: **Majestic Contractors, Ltd.**, Odis Hare, spread superintendent, office at Cooksville, Ont.

Israeli Government

Project: A 6-in. line from the Haifa refinery to Tel Aviv.

Completion: Late 1957.

National Iranian Oil Co.

Project: 573 miles of 10-in. from Ahwaz to Teheran, Iran.

Contractor: **Enterpose of Paris,** has northern 236 miles. Southern section completed.

- **North Atlantic Treaty Organization (NATO)**

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Status: Under way.

Contractors: **Associated Pipeline Contractors, Inc.**, has 450 miles from Iskenderun, Turkey, to Batman. **TECHINT** (Compagnia Tecnica Internazionale), Milano, Italy, has 205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir. Bids were taken in January 1956 on 300 miles of 12-in. between Marseille and Langres, France. Taking bids on 275 miles in northwestern France: 54 miles of 2-in. from Langres to Mirecourt, 63 miles of 2-in. from Mirecourt to Phalsbourg, 47 miles of 8-in. from Mirecourt to Metz, 30 miles of 8-in. from Phalsbourg to Deux Ponts, 35 miles of 8-in. from Phalsbourg to Strasbourg.

Foreign Natural-Gas Pipelines

• **Alberta Gas Trunk Line Co., Ltd.**

Project: 637 miles of 34 to 16-in. gathering lines in Alberta.

Contractor: **Dutton-Williams Brothers, Ltd.**, has preliminary studies, design and management-engineering. **Mannix, Ltd.**, has crossing of Red Deer River near Cavendish, Alta., J. Hysuick, spread superintendent, office at Empress.

Status: Mannix, Ltd., work to be completed March 1957.

Andes Pipeline Corp. (Subsidiary of Glenn McCarthy, Inc.)

Project: 500 miles of 12-in. from McCarthy's Bolivian concession to the Chile copper-mining area.

Status: Proposed.

Contractor: Will do own work.

• **Attock Oil Co.**

Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.

Status: Planned.

Cia. Shell de Venezuela.

Project: 177 miles of 20-in. from La Paz field in the Maracaibo district, to the Cardon refinery on Paraguana Peninsula, to fuel refinery furnaces.

Status: Under way.

Contractor: **Williams Brothers Co.**

Completion: 1957.

• **Empresa Nacional Del Petroleo.**

Project: 80 miles of 10-in. from Concon to Santiago, Chile.

Status: Planned.

Gaz de France

Project: 550 miles of 16 to 24-in. from Lacq field, southwestern France, to Paris, plus a 10-in. lateral to Nantes and 12 to 16-in. laterals to Lyons, making a 1,000-mile system.

Status: Right-of-way work under way.

Contractor: Being handled by French contractors.

Completion: First stage in 1958; complete system in 1960.

Inland Natural Gas Co., Ltd.

Project: 304 miles of mainline and 25 miles of laterals from Savona to Nelson, B. C.: 150 miles of 12-in.; 112 miles of 10-in.; 67 miles of 6-in. Also will build 400 miles of distribution piping in 31 towns.

Status: Under way.

Contractor: **Dutton-Williams Brothers, Ltd.**; Pat Campbell, project manager, office at Penticton.

Completion: October 1, 1957.

Petroleos Mexicanos

Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey in northern Mexico.

Status: Planned.

Saskatchewan Power Corp.

Project: 300 miles of 1 to 20-in. distribution system at Regina City.

Status: Will start in 1957.

Contractor: **Fulton Banister, Ltd.**

Completion: October 15, 1957.

Sui Gas Transmission Co.

Project: 188 miles of 16-in. from Sui gas field to Moultan, Pakistan.

Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang, Magiana, and Montgomery.

Contractors: **Pakistan Constructors,** a joint company of **Morrison-Knudsen** of Boise, Idaho, and **William Press, Ltd.**, of London.

Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venezuela.

Project: 207 miles of 26-in. from Anaco fields to Caracas.

Status: Under way.

Contractor: **Fulghum Contracting Corp.** will be consultants; **Petrogas, S. A.** will engineer and construct the line.

Completion: Spring 1959.

• **Trans-Canada Pipe Lines, Ltd.**

Project: 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg. (First part of 2,250-mile line from Alberta to Toronto and Montreal.)

Status: Under way.

Contractors: **Majestic Contractors, Ltd.** (104 miles from Burstall to Stewart Valley, Sask., R. L. Leaonard, spread supt., office at Cabri.; **Canadian Bechtel, Ltd.** (110 miles from Swift Current to Moose Jaw, Sask., J. L. Work, general supt., office at Moose Jaw, and 54 miles from Partoze La Prairie to Winnipeg); **Mannix, Ltd.** (90 miles from Moose Jaw to Welseley, spread superintendent, T. Anderson, office at Montmartre, Saskatchewan); **Dutton-Williams Brothers, Ltd.** (97 miles from Deveren to Moosomin, under way, to complete August 1957). **Price-Poole of Canada, Ltd.** has 100 miles from Miniota to near McGregor to start in 1957.

Completion: August or September 1957.

• **Union Gas Co. of Canada, Ltd.**

Project: 142 miles of 26-in. from Dawn Township to Toronto Township, Ontario, plus 50 miles of 8 to 20-in. laterals.

Status: Planned.

Completion: November 1957.

Project: 17 miles of 8 to 20-in. storage lines in Dawn Township, Ontario.

Status: Planned.

Completion: August 1957.

• **Westcoast Transmission Co., Ltd.**

Project: 650 miles of 30-in. from Peace River area, Canada, to Sumas, Wash.

Status: Under way. About two-thirds completed.

Contractors: **Dutton-Williams Brothers Ltd.**, has 120 miles from Taylor, B. C., to Azouzetta Lake, completed; **Mannix, Ltd.**, has 110 miles between Huntingdon and Merritt, G. Lyons, spread superintendent, office at Hops, B. C.; **Canadian Bechtel, Ltd.**, has 210 miles from Alexandria to Pine Pass, B. C., H. F. (Hank) Mogg, spread man, office at Quesnel, B. C.; **R. A. Conyes Construction Co.**, has 210 miles; **River Construction Corp., Ltd.**, has under way 150 miles of gathering lines in northern Alberta and British Columbia; **Marine Pipeline & Dredging, Ltd.**, has Fraser and Peace River crossings.

Completion: Dutton-Williams section completed. R. A. Conyes section and Canadian Bechtel section to be completed September 1957. Marine Pipeline work to be completed April and May 1957.

Project: 174 miles of 30-in. from Savanna Creek area to the Canadian-Idaho border.

Status: Proposed.

• **Yacimientos Petroliferos Fiscales (Argentina)**

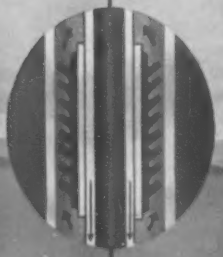
Project: 1,056 miles from Campo Duran to Buenos Aires.

Status: Proposed. Bids will be taken beginning the end of January 1957.

FOUR REASONS WHY

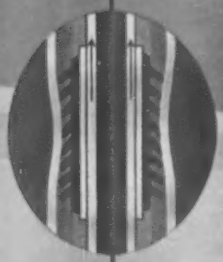
MISSION E-Z SWABS

are fast, safe and economical



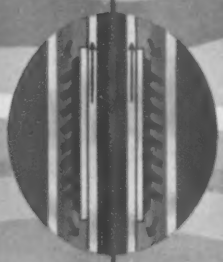
1. FREE FALLING

On the down stroke, clearance between fins and pipe allows swab to fall free.



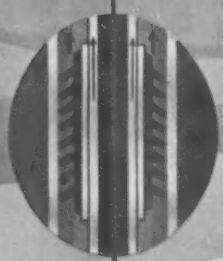
2. PASSES SMOOTHLY THROUGH TIGHT SPOTS

Flexible E-Z Swab Rubber fins allow swab to pass smoothly through tight spots on both up and down strokes.



3. RELEASES OVERLOADS

When load is excessive, fins bend down to bypass excess fluid. This safety relief action prevents overloads and broken wire lines.



4. LONG LASTING

After overload is bypassed, fins spring up until they seal. Wear is slow because fins seal against pipe with light contact pressure.

Nothing but the finest will bear the name of

MISSION MANUFACTURING CO.

Mission E-Z Tubing and Casing Swabs are made in seven popular sizes (1½", 2", 2½", 3", 4½", 5½", and 7"). They are available through supply stores everywhere. Be sure to get a Mission E-Z Swab before your next swabbing job.

PESA

PARTNERS IN PETROLEUM PROGRESS

MISSION MANUFACTURING CO. • P. O. Box 4209 • Houston, Texas • Cable Address—"Missco" • Export Office: 30 Rockefeller Plaza, New York
In The United Kingdom: MISSION MANUFACTURING CO., LTD. • 17 Hanover Square • London, W. 1. England • Cable Address—"Missoman"

SLUSH PUMP VALVES • PISTONS • VALVE SEAT PULLERS • LINERS • PISTON RODS • VALVE SPRINGS • GLAND PACKINGS • • SLIPS • SWABS • PLUG VALVES • CENTRIFUGAL PUMPS

22-month test showed substantial savings from using

MISSION MUD MONARCH VALVES

OVER 2400 VALVES AND SEATS were used by a large operator during a 22-month test comparing the cost of Mission Mud Monarch fluid end mud pump valves and seats with the competitive make he was using at the beginning of the test. Due to the size and duration of the test, results may be considered conclusive for the 2500-psi pressures and other conditions encountered.

This test showed that Mission Mud Monarch Valves and Seats cost less than half as much per thousand feet of hole as the competitive make.

Why don't you make a competitive test yourself to find out just *how much* Mud Monarch Valves can save *you?* Many operators have reported important savings at normal pump pressures, even though the advantage of using Mud Monarch Valves becomes greater as pressures become higher. Arrange with your Mission Representative for a competitive test.

COMPETITIVE VALVES

cost more than $36 per thousand feet of hole.

MUD MONARCH VALVES

cost less than $18 per thousand feet of hole!

Nothing but the finest will bear the name of

MISSION MANUFACTURING CO.

Keep your valve costs down—specify Mission Mud Monarch!

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SHOWCASE...

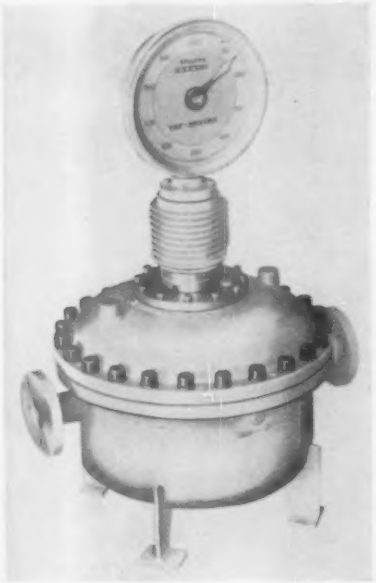
NEW EQUIPMENT

Integrating Counter for Pneumatic Transmissions

A new development for use with pneumatic transmission systems is this Bristol remote-integrating counter. The seven-digit counter receives its signal from a measuring transmitter which operates on an impulse-duration system.

The counter is housed in a small flush-mounting case for use near a pneumatic-recording or indicating receiver on a panel board, or in whatever location its use would prove most valuable. **Write or call: Bristol Co., Waterbury 20, Conn., for Bulletin A128.**

●



P.D. Flow Meter Measures Still Bottoms, Asphalt

This new Brooks VAF positive-displacement flow meter is suitable for hard-to-handle fluids such as bunker oils, still bottoms, and asphalts, the maker states.

The meter is available in sizes from 1 to 6 in. at capacities up to 450 g.p.m., temperatures to 660° F., and pressures to 600 psi. Accuracies are guaranteed to be 0.25 per cent in the 1-in. size and 0.50 per cent in the 2 to 6-in. sizes. **Write or call: Brooks Rotameter Co., Lansdale, Pa., for Bulletin 400.**

Battery-Powered Hoist Speeds Loading

Powered by the truck battery, this new Pacific portable hoist lifts or lowers a ½-ton load quickly and efficiently. The hoist features an adjustable boom height and length, a 360° swing, and remote push-button control. Too, it can easily be moved from the truck body to a shop dolly in a few minutes.

Requiring little battery current, the hoist is designed for automatic braking at any point. Attachments are available for both gas bottles and oil drums. **Write or call: Burtchaell Heating Co., Hoist Division, 2944 S. E. Powell Boulevard, Portland 21, Ore., for more information on Pacific portable hoist.**

●

Cast-Steel Gate Valve Now Has Longer Dimensions

Greater protection to seating areas against heat distortion during the weld-

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in The OIL AND GAS JOURNAL - Issue of March 4, 1957

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

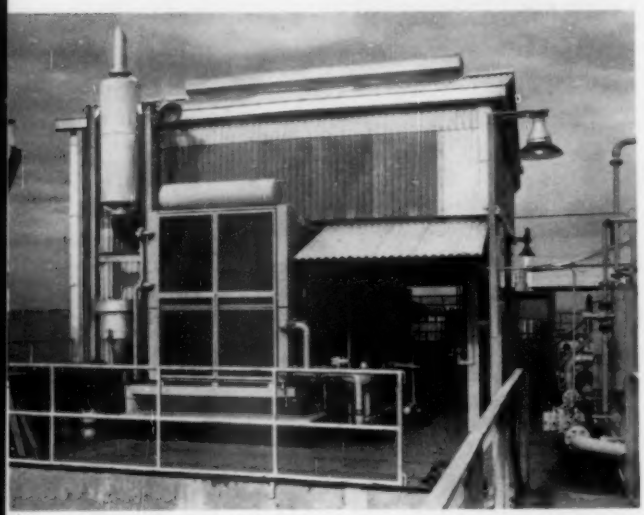
CITY..... STATE.....

DATE.....

Southwest

PACKAGED COMPRESSORS PERFECTLY BALANCED FOR PILING

Shell Oil Company — Block 35 — South Louisiana



FOR GAS LIFT, GAS BOOSTER, PRESSURE MAINTENANCE AND SIMILAR PROJECTS.

Here, in the Gulf of Mexico, this Southwest Packaged Gas Compressor, incorporating a Cooper-Bessemer GMXD-4 engine, compresses 4 million cubic feet of casing head gas per day from 350 to 900 psi. Proof that the perfect balance of the Southwest unit permits installation on any type of foundation. Pre-stressed concrete platforms, wooden piling, floating or submersible barges, are all the same to the rugged, perfectly balanced Southwest Packaged units. In addition to the economies of Packaged Gas Compressors, Southwest can deliver directly by barge from the Port of Houston to your location, eliminating costly rail-barge transfers.

The unattended operation, possible with the automatic controls and safety devices on Southwest Packaged Compressor Plants, cuts operating cost per horsepower-hour to a fraction of the cost of a fully attended stationary installation. A Southwest engineer can show you actual comparative operating costs. Available in sizes from 265 h.p. to 660 h.p.

SOUTHWEST INDUSTRIES, INC.

Post Office Box 7773, Houston 7, Texas

New Equipment

ing of line connections has been achieved by the use of longer end-to-end dimensions on Crane cast-steel gate valves for butt welding, the maker reports. The increase applies to Crane 150-lb. cast-steel gate valves in sizes from 2 through 24 in.

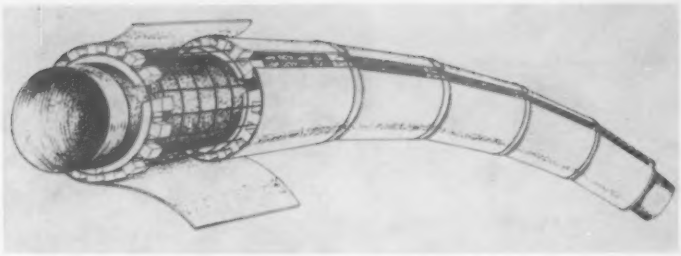
The new and longer dimensions comply with proposed A. S. A. Standard B16.10, given tacit approval by the Manufacturers Standardization Society of the Valve and Fitting Industry. **Write or call: Crane Co., 836 S. Michigan Avenue, Chicago 5, Ill., for more details on longer 150-lb. cast-steel gate valves.**

●

Electro-Pneumatic Positioner Developed for Control-Valve

Here's a new electro-pneumatic positioner that is now available as an integral component of Conoflow Series LB control valves. The Model E electro-pneumatic positioner provides valve positioning directly proportional to d.c. signals received from electronic instruments, according to the manufacturer.

The positioner eliminates the inherent transmission lag of all-pneumatic systems. **Write or call: Conoflow Corp., 2100 Arch Street, Philadelphia 3, Pa., for Bulletin LB-2.**



Concrete Coating Protects Pipelines

Here's a new type of concrete-coating process for use on pipelines in sizes from 4 to 30-in. o.d. Called Form-Crete, the process uses prepared and sacked material, weighted to the user's specifications.

Its components include carefully designed wraparound forms with reinforcing mesh and banding material combined with a special spacer-form arrangement.

The materials for the process are offered on a "do-it-yourself" rental basis, with the weighting material supplied presacked. Or the complete service is available.

According to the manufacturer, the process is a better and easier way to protect and weight pipe than by conventional methods.

The pouring mix is preportioned and sacked on a standard basis for various weights. It features uniformity of quality control. And little labor and supervision are required. **Write or call: Mallard & Hinkle, 3800 W. Alabama, Houston, Tex., for more information on Form-Crete.**

Stem Thermometer Shows High, Low Temperature

On this new maximum-minimum stainless-steel stem thermometer are two ancillary indicators. These can be set manually against the high and low sides of the indicating pointer by a knob in the center of the glass window. The maximum - minimum hands then move up and down the scale. They remain at the extreme temperature reached until they are manually reset.

The knob is sealed hermetically on the glass window so no fumes or moisture can leak through. The thermometer is precision built with a stainless-steel stem and a large easy-to-read dial.

It withstands corrosion and can be used in liquids or gases. And it doesn't require preheating for use in hot materials, according to the maker.

The thermometer is of the direct-drive bimetallic type, without gears or linkage. Accurate to 1 per cent over the entire scale, it's available in seven ranges with either 2 or 3-in. faces and stainless-steel stems in lengths from 3 to 86 in. **Write or call: Pacific Transducer Corp., 11836 W. Pico Boulevard, Los Angeles 64, Calif., for information on stainless-steel stem thermometer.**

●

Multipoint Recorder Handles 16 Points on One Chart

Easy to read, operate, and service, this new Series 8000 Wheelco electronic multipoint recorder can be used for the permanent recording of up to 16 points on one chart, the maker states.

A null-balance type of instrument, it allows measurements to be obtained with such sensing units as thermocouples, radiation detectors, and similar devices where the measured variable

SHOWCASE . . .

New Equipment

can be resolved into an electrical signal.

Up to six limit switches may be incorporated to provide for high and/or low-signal indication. Up to four of the switches may have a common front set. The additional switches are independently adjustable. **Write or call: Wheelco Instruments Div., Barber-Colman Co., Rockford, Ill., for Bulletin F-7955.**

Interchangeable jackets can be obtained for heating the meter while on flow. The Model DC-111 is designed for linear reading with an Atcotran explosionproof differential transformer and Atcotran dial indicator. **Write or call: C-Mar Corp., 35 Euclid Avenue, Manasquan, N. J., for details on Model DC-111 meter.**

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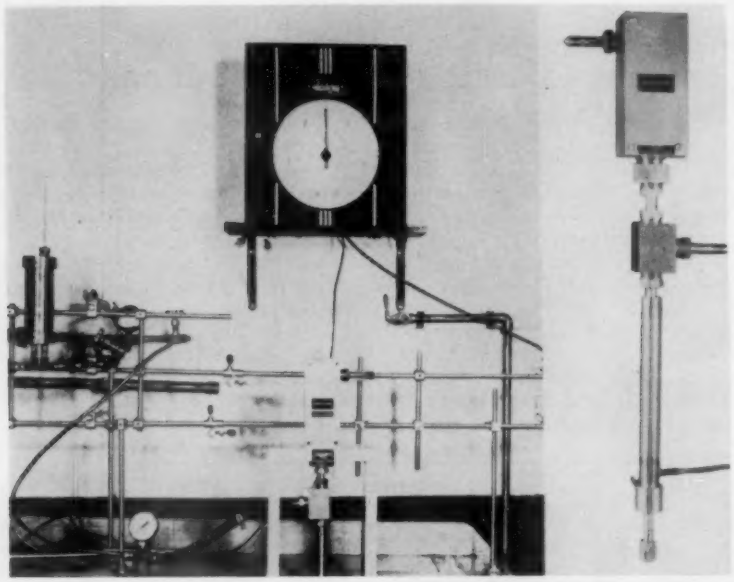
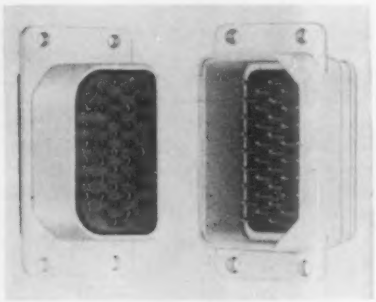


New Meter Controls Flow to 15,000 Psi.

Here's a new high-pressure flowmeter for metering and control of liquids and gases that is rated at 15,000 psi. at 100° F.

Three interchangeable stainless-steel flow tubes with variable tapered orifices and floats on the unit permit up to 30 desired flow ranges from 0.1 (minimum) to 13 liters (maximum) per minute. Made of stainless steel, the meter employs nonmagnetic construction and weighs only 35 lb.

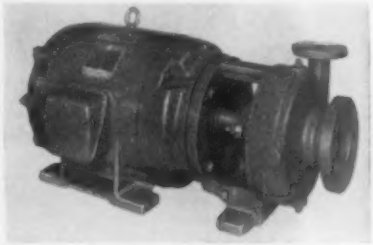


Rack-and-Panel Connector Protects Against Vibration

A solid shell and a resilient insert on this new type of rack-and-panel electrical connector facilitates pressurization and gives maximum protection against the harmful effects of vibration, according to the manufacturer.

Called the SR type, its features include: (1) solid shells, (2) resilient inserts, (3) low contact-engagement forces, (4) easy pressurization to the latest MIL specification, (5) closed-entry sockets, (6) heavily gold-plated contacts, and (7) a cadmium-plated clear-irridite finish. The connector operates in the temperature range of —67° to 250° F. Insert patterns will be available to mate with existing equipment now in service. **Write or call: Scintilla Div., Bendix Aviation Corp., Sidney, N. Y., for details on Type SR connector.**

●



Close-Coupled Pump Can Save on Space

For the pump user who wants to conserve on space, this new Type GSC close-coupled centrifugal pump may be the answer. It's designed to handle a wide range of general applications

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in The OIL AND GAS JOURNAL - Issue of **March 4, 1957**

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

New Equipment

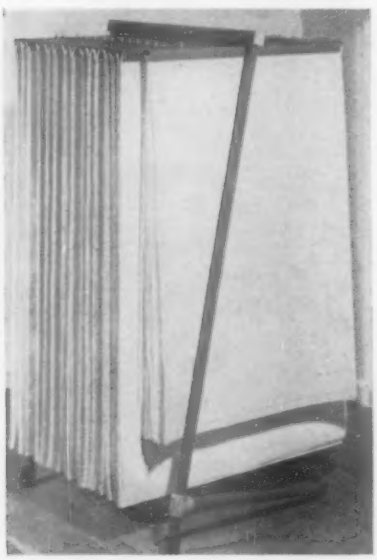
where conditions do not necessarily require a more costly designed pump.

Its capacity ranges up to 600 g.p.m. And the total dynamic head ranges up to 275 ft. The temperature range of liquids that can be pumped is from —40° to 250° F.

The pump is available from stock in materials of three standard classifications: bronze-fitted, all-iron, and all-bronze.

Standard pump construction includes: (1) a removable back head to permit removal of the impeller without disturbing the piping, (2) a large cradle opening for free access to the stuffing box, and (3) a stuffing box adaptable, interchangeably, to packing and mechanical seals. **Write or call: Dean Brothers Pumps, Inc., 323 West Tenth Street, Indianapolis 7, Ind., for details on GSC pumps.**

●



Filing System Makes Maps, Drawings Easy to Store

The new and unusual diagonal leg rack shown here, called the Model AR, provides a sturdy, self-supporting holder for Dancer Stikfile binders, the maker reports. The rack and binders make an efficient method for binding and vertically filing blueprints, maps, drawings, and similar sheets.

The binder uses a metal channel with a hardwood dowel to form a removable core. This core adjusts up or down with metal screws. The screws are threaded through the top of the channel, wedging the sheets firmly.

The binders are available in 12 stock lengths and the rack is available in several models to accommodate the binders. **Write or call: Dancer Co., P. O. Box 10221, Houston 18, Tex., for more information on the Model AR blueprint filing system.**

●

Liquid-Degreasing Compound Makes Tank Cleaning Safer

Here's a new liquid-degreasing and emulsifying compound that is expected to solve the problem of safely cleaning oil-storage tanks, particularly the sludge accumulation from heavy oils.

Called MM-17, it also effectively emulsifies oil spills on water and other surfaces, the maker reports. It may prove valuable for cleaning pipes, pumps, and other equipment in oil fields, refineries, bulk terminals, and tankers.

According to the maker, the compound is safe to use, as it has no toxic fumes or burning effect on the hands.

MM-17 comes packed in 55-gal. drums, weighing about 490 lb. per drum. **Write or call: Daniel Co., 17 Bolt Street, Lowell, Mass., for bulletin on MM-17 Compound.**

7326-HC

Corrosion has an expensive appetite

PROTECT YOUR INVESTMENT WITH A Harco CATHODIC PROTECTION SYSTEM

If you can afford the bill . . . enjoy your guest. But remember . . . you've got this guest whether you can afford her or not. Check your profits . . . and see what this appetite is costing you regularly.

Electrolytic corrosion is the biggest single destroyer of buried or submerged metal structures and pipelines.

IT CAN BE STOPPED. That's where HARCO comes into the picture. It's our business to protect your investment. We are the specialists who can prevent and cure electrolytic corrosion . . . QUICKLY AND ECONOMICALLY. It is a fact . . . most cathodic protection systems pay for themselves in a matter of months . . . just through savings in normal maintenance and replacement costs.

HARCO regularly supplies a complete range of services. Whatever your needs . . . engineered systems, contract installations or materials . . . LOOK TO HARCO . . . FIRST IN THE FIELD OF CATHODIC PROTECTION!

Write today for catalog or call MOntrose 2-2080.

Harco

CATHODIC PROTECTION DIVISION

THE HARCO CORPORATION

16961 Broadway • Cleveland, Ohio

SHOWCASE . . .

New Literature

Glass for the Laboratory. This new catalog of products for the laboratory supplies illustrations and price information on Glenlab products. The products include: (1) fractionating-distillation columns in diameters from ⅝ to 4 in., (2) packing type of columns in diameters from ¾ to 2 in., (3) concentric-tube columns, (4) still heads in both automatic liquid-dividing and automatic vapor-dividing types, (5) solenoids, and (6) timers. One section of the publication describes the company's available services in the manufacture of specialized glass apparatus. **Write or call: Glass Engineering Laboratories, 578 O'Neill Avenue, Belmont, Calif., for catalog on laboratory products.**

●

Single - Window Eye Protector. Two-page, three-color Bulletin 53 describes a new single-unit picture-window type of goggle for full view and maximum protection for the eyes in brazing, cutting, gas welding, grinding, and similar work. The goggle described is available with an adjustable elastic headband or with a headrest support with a positive single-point friction joint. **Write or call: Fibre-Metal Products Co., Chester, Pa., for Bulletin 53.**

●

How to Operate a Lift Truck is an informative 24-page, 2-color, 8½ by 11-in. booklet. Using a two-color cartoon technique for easy reading, it is packed with information about the operation of a lift truck, preventive maintenance, safety, and basic materials handling. Prepared for use as part of an operator-training program, the booklet is slanted for both the beginner and the experienced operator. It can be studied individually by the operator or used as a guide by instructors. **Write or call: Hyster Co., 2902 N. E. Clackamas Street, Portland 8, Ore., for booklet, How to Operate a Lift Truck.**

●

Steel Tubing and Fittings for vacuum systems and conveying lines carrying liquids, gases, or air-born solids are detailed in this six-page foldout. Furnishing complete specifications on the products, the bulletin points out that the tubing and fittings can be quickly and easily installed, often cutting installation costs as much as 50 per cent. Too, their smooth walls provide a streamlined free-flowing directional design resulting in a high load capacity. The tubing can also be obtained with linings of various synthetics for corrosion and abrasion resistance. **Write or call: H-P Products, Inc., Louisville, Ohio, for Bulletin V-157.**

●

Packless Valves for applications involving hazardous liquids and gases is described in new 22-page, 3-color Catalog F. More than 20 cutaway views show different packless-valve models. The catalog furnishes detailed data on specifying, ordering, application, and selection of packless valves. One chart lists the resistance of various metals used in packless valves to the corrosive action of more than 200 different chemicals and gases. **Write or call: Fulton Sylphon Division, Robertshaw-Fulton Controls Co., Box 400, Knoxville 1, Tenn., for Catalog F.**

●

Rubber Insulated Neoprene - Sheathed Nonmetallic Cables, their composition, tested "in use" properties, and suggested applications are discussed in this 40-page bulletin. The new bulletin provides helpful information for all who specify for electrical construction. Appropriate charts for the cables provide data on size, strand construction, insu-

HAPPY FAMILIES
on a Prairie . . .

This photograph might have been taken in a new suburban section of a large city. But, it wasn't. This community is miles from any town, and is located at a gas pipe line booster station in Louisiana. These are modern STURDYBILT Prefabricated Homes, planned and designed by our staff architect for the utmost in comfort and livability.

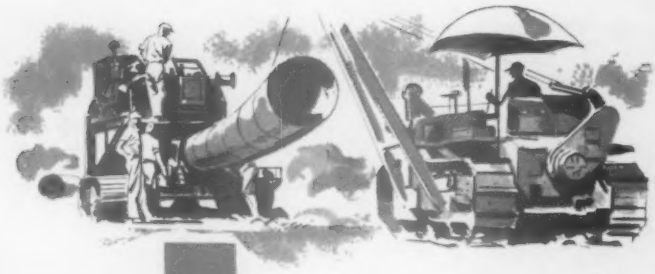
When you need modern housing at reasonable cost, investigate buying or leasing STURDYBILT Houses.

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

phmi

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES



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ENGINEERING CORPORATION

HOUSTON, TEXAS

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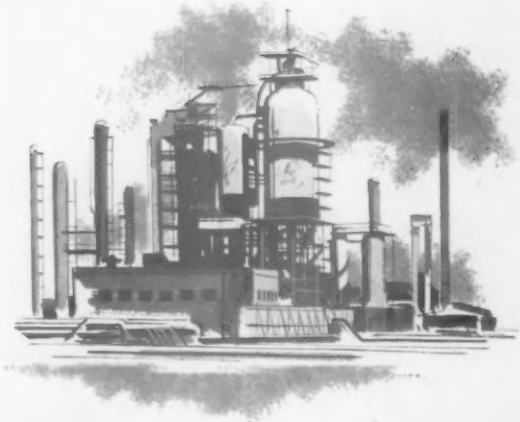
If you are considering new facilities in the oil, gas, chemical or allied industries, you can get valuable assistance from Fish Engineering Corporation and subsidiary companies. At Fish, you will find some of the finest economists, engineers and construction men in the world. They are ready to work with you every step of the way from feasibility studies through engineering, financing, construction and operation.



Affiliated Companies

FISH SERVICE CORPORATION

FISH NORTHWEST CONSTRUCTORS, INC.

New '57 Fords

New T-800 tandem (*left*) 45,000-lb. GVW. High Torque 212-hp V-8 engine, 4-barrel carburetor and Master-Guide power steering, standard.

More modern in more ways ...to cut your costs!

Boldly modern! That's the *big* news in Ford trucks for '57. Modern styling outside—modern engineering through and through. They're the most *efficient* trucks Ford has ever built—engineered to cut your costs.

Look at Ford's new Extra Heavy Duty tandem models. They're at home with any load, anywhere! See the brand-new line of Tilt Cabs . . . the lowest-priced* in America. And Ford's new pickup with its smart-looking Styleside body gives you the biggest capacity in the half-ton field—*standard at no extra cost!*

Under the hood of a '57 Ford, you'll find important new advances in power. Engine breathing is freer, more efficient. And every engine—V-8 or Six—offers the cost-cutting benefits of Ford's modern Short Stroke design.

New Driverized Cabs are roomier, more comfortable than ever. And new structural design improvements make these the strongest Ford Cabs ever built.

Deep down it's a rugged truck, too! There's new toughness everywhere—in stronger frames, in sturdier axles, in higher-capacity springs.

One look at these completely new, boldly modern Ford trucks for '57 will make you want to see just what they can do. Your Ford Dealer will gladly furnish complete information.

**Based on a comparison of factory-suggested list prices*

New Tilt Cab line (*below*) offers six series ranging up to 60,000-lb. GCW, up to 212 horsepower. Now, all the advantages of "cab forward" compactness, plus greater service accessibility and cab comfort.

ONLY FORD GIVES YOU ALL THESE DEEP-DOWN MODERN FEATURES:

NEW Driverized cabs—stronger, roomier, smarter! New wider full-wrap windshield. New inboard cab step, new Hi-Dri ventilation.

NEW Heavy Duty V-8's now have 4-barrel carburetion standard. Fresh-air intake with new thermostatic control available on 302 and 332 V-8's.

NEW hydraulic clutch, standard on all models. Easier to operate—works like hydraulic brakes. Foot pedals are modern suspended type.

NEW riding comfort! New chassis suspension and roomy cabs with increased visibility combine to greatly improve riding and handling ease.

NEW power advances! Higher horsepower, increased compression ratios, freer breathing. New Super-Filter air cleaner. New advancements from camshafts to carburetors!

NEW chassis strength! New frames, up to 13% stronger. New sturdier axles! New higher capacity springs.

FORD TRUCKS COST LESS

. . . LESS TO OWN . . . LESS TO RUN . . . LAST LONGER, TOO!

lation sheathing, outer diameter, and shipping weights. Punched for filing, the bulletin also furnishes appropriate data on the cables' current-carrying capacities. **Write or call: National Electric Products Corp., Gateway Center, Pittsburgh 22, Pa., for bulletin, Rubber Insulated Neoprene-Sheathed Nonmetalic Cables.**

●

Warehouse, Laboratory, and Office Equipment Catalog. This new 24-page 1957 catalog illustrates a wide variety of office equipment, industrial ovens, lockers, safety ladders, utility trucks, and related equipment. One of the many new items listed is a completely transistorized portable, battery-operated public-address system **Write or call: Precision Equipment Co., 3706A Milwaukee Avenue, Chicago 41, for 1957 catalog.**

●

Selector Valves in sizes of ⅛ to 1 in. for air and other gases, hydraulic oil, nonaromatic fuel, petroleum, and water are described in new Catalog 356A. The valves' working-pressure range for air and other gases is 0 to 500 psi. For liquids, it's 0 to 1,000 psi. The operating temperature range is 65° to 160° F. For ease in valve selection, the catalog lists the valves' specifications, installation dimensions, and parts numbers. **Write or call: Republic Manufacturing Co., 15655 Brookpark Road, Cleveland 11, Ohio, for Catalog 356A.**

●

Servo-Motors Bulletin 385 (10 pages) gives the characteristics, drawings, and application data on Norden-Ketay servo motors. Its data includes complete electrical and mechanical specifications and application data on direct plate-to-plate transistorized servo amplifiers and magnetic servo-amplifiers. The standard servo motors are available in five frame sizes and complete ranges of input voltages, frequencies, and speeds. **Write or call: Norden-Ketay Corp., Commerce Road, Stamford, Conn. for Bulletin 385.**

●

Neoprene and Hypalon Synthetic Rubber. Here is a new booklet that gives a concise description of both synthetic materials. The 16-page bulletin explains the features and applications of each material and how the properties of each one can be controlled through the use of compounding ingredients. Cartoons depict the physical properties of the compounds, and convenient tables list the chemicals having little or no effect on the compounds. **Write or call: Elastomer Chemicals Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del., for Neoprene, Hypalon elastomers booklet.**

●

Proper Wire Rope for Construction Equipment is set forth in this six-page folder, Bulletin 5702. By photographs, drawings, and reeving diagrams, the new brochure illustrates the proper wire rope to use for all types of equipment. And it includes a discussion of lang-lay versus regular-lay rope, rope constructions, and the proper wire rope to use for clamshell-bucket operation. **Write or call: Macwhyte Co., Kenosha, Wisconsin, for Bulletin 5702.**

●

Tractor Operator's Guide, a new 4-color, 12-page booklet, presents basic information on the operation of Caterpillar tractors and the jobs they can do. The illustrated booklet describes in simple terms the way to get the most work out of a unit with the least amount of effort. Picturing the operating components found on the tractors, it explains, step by step, each phase of a complete operating cycle. And it includes instructions for: (1) towing scrapers, (2) ripping, and (3) using straight and angling bulldozers. **Write or call: Caterpillar Tractor Co., Peoria, Ill., for Form 32109-DE636.**

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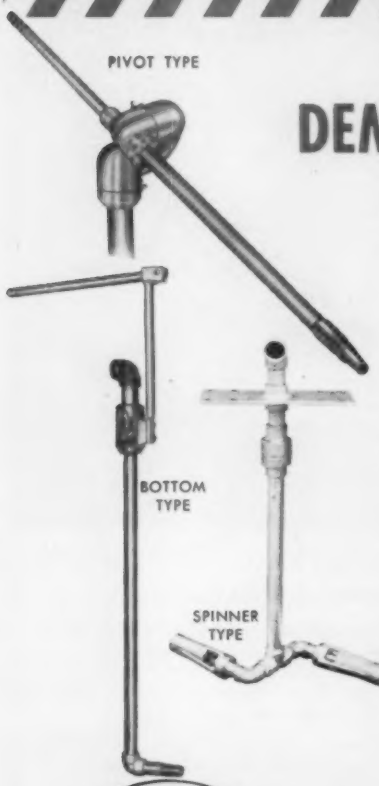

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Provides maximum jetting action where needed. Rugged Swivel Joint rotates on double rows of ball bearings. Swing handle has boxed joint. Replaceable, hardened steel jet nozzle.

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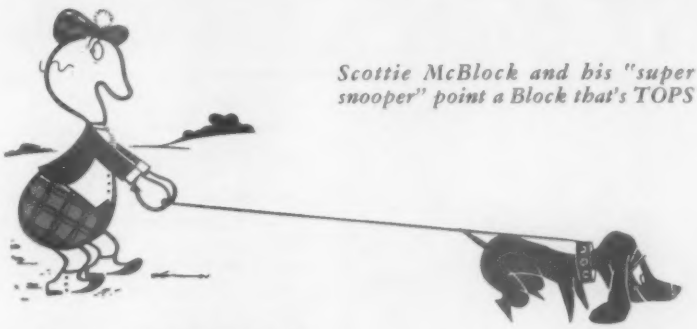

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Here's the block with the very widest range of sizes and capacities. For most efficient, trouble free handling of tubing, rods, etc.

Featuring E-Z opening guards, an exclusive McKissick feature, for quick, simple reeving, a few turns, bolts swing out. No parts removed — guards swing on extended arm to closed position and lock bolts tightened.

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EQUIPMENT MEN . . . in the News

Magcobar's Division Managers Hold Annual Meeting

Magnet Cove Barium Corp. has just completed its annual meeting for division managers, it has been announced by Frank Loe, sales manager, drilling-mud department.

Company plans for 1957 production, distribution, product development, and sales and service were discussed. A preview of Magcobar's field training program was also presented.

Division managers attending were (left to right): C. H. Sydow, Jr., Texas Gulf Coast division; E. O. Taulbee, northeastern division; Fred S. Parker, Canadian division; Roy Stringfellow, Shreveport division; Frank Loe; James C. Hewitt, export division; Robyn P. Fulton, Mid-Continent division; R. W. Hinchliffe, offshore division; and J. H. McLaurin, southeastern division.

Rolo Manufacturing Names Canadian Representative

D. SCHMEECKLE

The appointment of Duane Schmeeckle as Rolo representative for Canada has been announced by C. B. Truitt, general sales manager of Rolo Manufacturing Co., Houston.

Schmeeckle formerly was division mechanical engineer for Shell Oil Co. in Edmonton. He had been with Shell in Canada for 5 years.

Schmeeckle's firm, Petro-Automation Industries, Ltd., has its headquarters in Edmonton, Alta.

Tubular Lining Corp. Names McBride and O'Brien

C. J. (Neil) McBride has been appointed director of research and J. Walter O'Brien has been named production manager for Tubular Lining Corp., applicators and compounders of plastic linings for oil-field tubing. The announcement was made by Larry E. Heinen, president of the Houston firm.

McBride will direct the activities of the research and development department. Before assuming his present position, he was assistant chief chemist at Tube-Kote, Inc., and technical director at Plastic Applicators, Inc.

O'Brien will be responsible for all production work. He will supervise the new method of applying plastic lining to oil-field tubing. With the plant in full production, O'Brien pointed out, the present facilities will line 5,000 lineal feet of tubing each working shift.

Parkersburg Sets Up Metal Building Division

Bernard P. McDonough, president of Parkersburg-Aetna Corp., Parkersburg, W. Va., has announced the establishment of a metal building division of the corporation's Parkersburg Rig & Reel Co. division. Effective January 1957, preengineered metal buildings will constitute a separate division with its own sales, engineering and manufacturing facilities under the direction of General Manager Corbie L. Wilson.

Under the decentralization concept, metal buildings become the fifth segment of the company product line to operate as a division. Previously, oil-field pumping units, pressure vessels used in field processing of oil and gas, lease storage tanks, derricks, hydromatic brakes and grain storage tanks for the agricultural market were divisionalized with headquarters in Tulsa, Houston, and Fort Worth, Tex., respectively.

Regional sales offices have been established at key locations nationally and regional sales managers appointed. These include A. Peter Kilbourn, Dallas; Kenneth H. Rauth, Atlanta, Ga.; and Earl B. Wilkinson, Chicago.

Brown & Root Elects Two Vice Presidents

W. Hurd Manahan and Wayne E. Williams have been elected vice presidents by Brown & Root, Ltd., Edmonton, Canada. Manahan is vice president in charge of construction, and Williams is in charge of design engineering and sales.

Manahan has been associated with western Canadian oil and chemical industries since 1953 when he was assistant general superintendent for Brown & Root on the Canadian Chemical Co. plant at Edmonton. He was general superintendent on Texaco Exploration Co. gasoline plant southwest of Edmonton and has been general manager of construction on various projects in Canada for Brown & Root.

Williams came to Brown & Root in 1951 when he was assistant general superintendent on the Candian Chemical Co. plant at Edmonton and was general design coordinator on the project.

Dowell Transfers Steanson to Tulsa

R. E. STEANSON

R. E. (Bob) Steanson, general sales engineer for Dowell Incorporated at Fort Worth, has been transferred to Tulsa, according to R. S. Ousterhout, sales manager, services division, Tulsa. He will make his headquarters at Dowell's general offices. Steanson will replace P. J. Millar who is being transferred to Dowell's new Farmington, N. M., office as district sales manager. M. W. (Ozzie) Osborne, sales engineer at Abilene, will replace Steanson in the Fort Worth sales office.

Steanson has been in Dowell's Fort Worth office for more than 2 years. He joined Dowell in 1950 as a service engineer at El Reno, Okla. He has also been located at Pauls Valley, Okla., and Midland, Tex., before going to Fort Worth.

Osborne has been with Dowell since 1952, starting as a junior service engineer at Wichita Falls, Tex. In 1953 he moved to Vernon, Tex., as station manager. He served as station manager at Gainesville, Tex., and in 1955 was promoted to area sales engineer and transferred to Abilene.

Girdler Announces Catalyst Plant Expansion

The Girdler Co., Louisville, Ky., has invested $450,000 in the expansion of its catalyst plant. The announcement was made by W. Roberts Wood, president of the company. Girdler is a division of National Cylinder Gas Co., Chicago, which is headed by Charles J. Haines.

Dr. Ronald E. Reitmeier, manager of the Girdler catalyst department, said the expanded facilities will increase production rates, permit the introduction of new catalysts in the petroleum, chemical, and food fields, and improve manufacturing processes.

Pritchard Promotes Frye To Vice President, Manager

The promotion of E. E. Frye to vice president and manager of the petroleum division has been announced by J. F. Pritchard & Co., Kansas City, Mo., designers, engineers, constructors and manufacturers for the petroleum and natural-gas industries.

Frye joined the Pritchard organization as manager of the gasoline-plant section of the petroleum division in 1947.

SSC Consolidates Tulsa Operations in New Facility

Seismograph Service Corp., world-wide seismic firm, has announced the opening of its new $900,000 Tulsa headquarters. Gerald H. Westby, president of the pioneer geophysical research organization, said personnel and equipment from seven separate Tulsa locations are now at one central point, and the move marks the first time the entire Tulsa organization has been under one roof since its early growth.

Climaxing the celebration of the firm's 25th year, occupation of the new seisimc center affords the company some 70,000 sq. ft. of research, and manufacturing space. The main building, a two-story structure, houses SSC's general offices, seismograph, Lorac and other electronic laboratories.

Westby joined SSC in 1933. He left a position as chief geophysicist for Empire Oil & Refining Co. to go with SSC.

Today SSC has four crews operating in Brazil, five in Venezuela, and two in Colombia. The company is now operating in 22 countries on five continents, and has subsidiaries in England, France, Italy, Libya, Colombia, Brazil, Bolivia, Mexico, Venezuela, and Canada. The British subsidiary, Seismograph Service, Ltd., has headquarters at Holwood, England.

Two of the company's outstanding developments in the equipment field are Lorac and continuous velocity logging.

Halliburton Transfers Gunn to Venezuela

V. V. GUNN

Vander V. Gunn, manager of South American subsidiaries for Halliburton Oil Well Cementing Co., is moving from the parent company's headquarters at Duncan, Okla., to Maracaibo, Venezuela. According to Ralph R. Emery, Halliburton's vice president for foreign operations and export sales, Gunn will be in closer touch with regional developments.

Gunn managed the Venezuelan subsidiary, Cia. Halliburton de Cementacion y Fomento, during 1947-55 and has since been at Duncan. He spent 10 years with Shell's Mexican subsidiary before joining Halliburton in 1938.

National Supply Opens New Facilities in Casper

A new and improved oil-field supply store has been opened by The National Supply Co. at Casper, Wyo., replacing older facilities there.

Constructed as part of the company's store-modernization program, the building is 100 ft. wide and 150 ft. deep. In addition to the salesroom, it includes a warehouse, a pump shop, and offices for store personnel. A used-equipment yard, with its own warehouse, adjoins the building.

National Supply has had a store in Casper since 1913. With the growth of its business, it acquired additional properties, including a warehouse and pipe yards. In addition to machinery and equipment for operators in the Casper area, the store serves as a stocking point for other stores in National Supply's Northwest division.

W. F. Harris is manager of the Casper store. C. W. Morris is manager of the Wyoming district, which also includes stores at Newcastle, Rock Springs, and Worland, Wyo., and Craig, Colo. The district headquarters, formerly in the Casper store building, have been moved to the Intermountain Building, Casper.

Oilwell Appoints Wells as District Representative

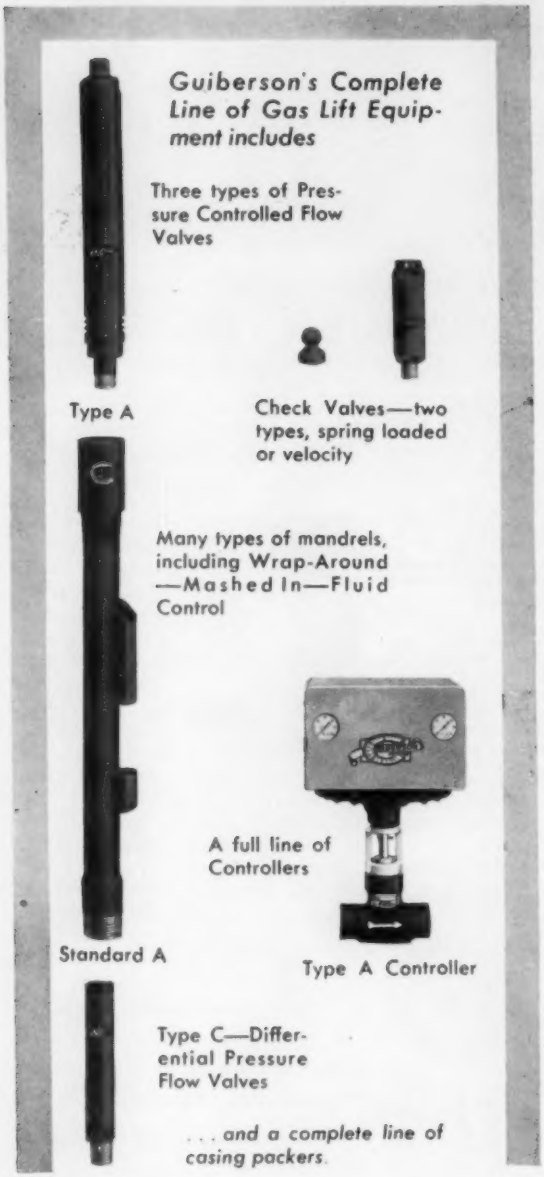
A. P. WELLS

The appointment of Aubra P. Wells as district representative at Midland, Tex., for the Oil Well Supply Division of United States Steel Corp. has been announced by William Miskimins, manager of Oilwell's Central Midwest area.

Wells, a veteran of many years' experience in the oil-field supply business, transfers to his new position from Farmington, N. M., where he was manager of Oilwell's branch store.

watch lift COSTS GO DOWN

with GUIBERSON GAS LIFT EQUIPMENT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Three types of Pressure Controlled Flow Valves
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When wells won't flow, operators in many fields are meeting rising oil production costs with gas lift. And more and more engineers and field men are finding that Guiberson equipment plus Guiberson experience is the way to the lowest gas lift cost with the greatest economy in initial installation.

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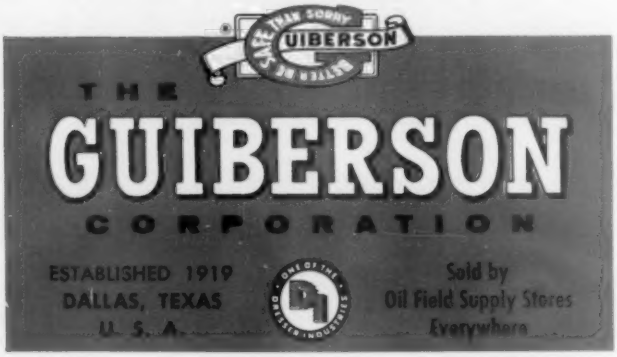
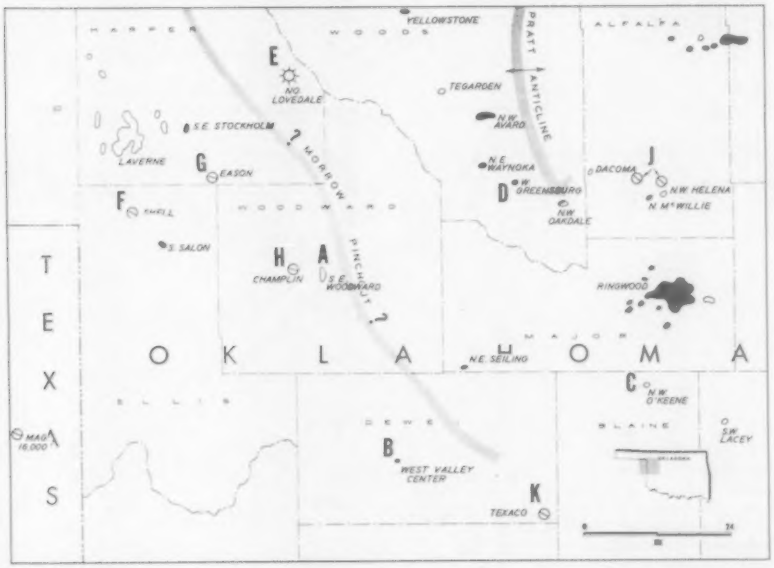
2,188,000 2,371,850 2,340,028 2,361,718 2,519,242
Other patents pending.





OKLAHOMA'S NORTHWESTERN COUNTIES are the scene of an active drilling and leasing campaign as the result of recent successes shown here. Ten different pay horizons plus medium depths should lure many more wildcats in the months ahead.

Oklahoma Looks Northwest

Anadarko basin's northern shelf is the lure

by Frank J. Gardner

TWELVE years ago, this map would have been perfectly blank as far as oil fields go. Today it is the scene of a flaming land play. This means that at long last, oil finders have realized the tremendous possibilities of the northern shelf of Oklahoma's Anadarko basin.

First and largest field in the map area was Ringwood, opened in 1945 in Major County. Main production was originally from the Manning (Mississippian), but later the 6,800-ft. Prue sand (Pennsylvanian) and the Cherokee produced.

For things to come . . . Then things rocked along for 5 years with no new developments. In 1950, the North McWillie discovery gave Alfalfa County its first field, with production from the Oswego-Pennsylvanian at 5,800 ft. Two years later, a couple of feelers went out to the west and opened Northeast Seiling in the southwest corner of Major County, and South Salon far to the west in Ellis County. Seiling was a Chester-Mississippian strike at 8,400 ft., and Salon (now abandoned) was a forerunner for things to come when it produced from the Morrow-Pennsylvanian at 8,455 ft.

In October 1953, the discovery of Arbuckle oil at Yellowstone, near the Kansas line, opened Woods County's first field, and once again flashed a warning signal to those who would find oil. This time the hint was taken. During 1954 and 1955, Northwest Avard, Tegarden, and Northwest Oakdale fields (the first two producing from Mississippian and the third from Simpson) appeared on the map. Woods County drilling painted a definite trend picture around the southwestern flank of the Pratt anticline jutting south from Kansas. This trend is still shaping up; Northeast Waynoka pool was added in 1956 (Cottage Grove-Pennsylvanian sand at 5,500 ft.), and just last month, West Greensburg pool was added. Here, (D on map) Gulf Oil Corp. (Unit) 1 Shade produced from Misener (Mississippian)-Hunton (Devonian) at 7,118-28 ft. to add another producing horizon to the seven already found. Also in 1956, Northwest Helena and Dacoma pools were found in southern Alfalfa County; Helena produced from Mississippian at 6,256 ft., while Dacoma (a reworked dry hole) found gas in the Cherokee at 5,838 ft. Yet another 1956 find was Northwest O'Keene, a Chester 7,400-ft. producer in Blaine County (C on map). Now, at the extreme northwest end of the play in eastern Harper County, North Lovedale pool (E on map) has added Viola-Ordovician at 7,000 ft. to the list of pay zones.

Just take your choice . . . So take your choice of 10 different pay targets, all at reasonable depths. Add the excellent odds for large strat traps along the shelf, and if this northwestern Oklahoma playground doesn't appeal to you as an oil finder, you'd better take up bird watching instead.

But better yet, look far to the west. Same basin, same state, same situation, but a little deeper. West of the postulated line of Morrow pinchout, other big things are happening. It all started up in Harper County, of course, with the fevered Morrow exploration in the Laverne area, but the Morrow 8,200-ft. strike at Southeast Woodward (A on map) in late 1956, added great chunks of new hunting ground to the trend. Immediately on the heels of this discovery came Sinclair's oil success in the 9,100-ft. Oswego at West Valley Center (B on map), adding Dewey County to the chain. Here is where the sweeping land play was set off. As soon as it dawned on the industry that the trend might shoot southeast as far as Blaine County, the race was on.

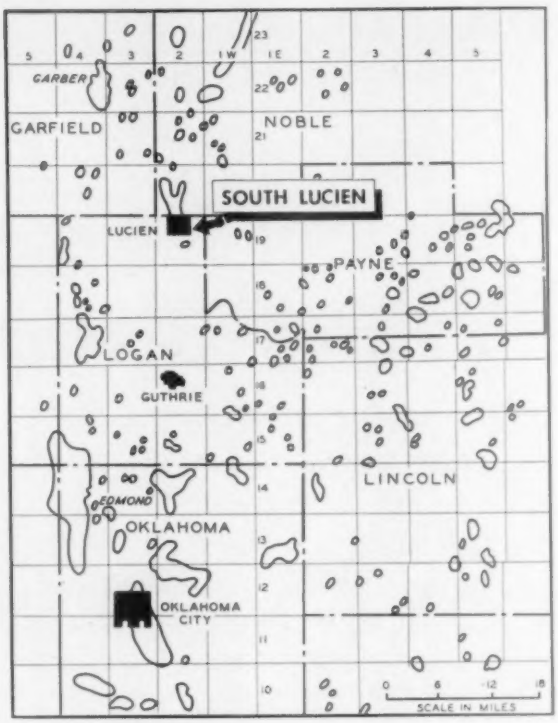
And sit and wait and watch . . . Next step? Sit, wait, and watch. Watch the wildcats now going down at F, G, H, J, and K. The Texas Co. 1 Boyd, at K, in southeastern Dewey County, will provide a key to the future. It's now at the testing stage at 7,500 ft. and no shows have been reported. If it's dry, the ardor will cool. If it hits, the stampede will be on again. Shell Oil Co. 1 Peetoom, at F, in Ellis County, is just now getting under way, but it too will be a key wildcat to watch; it's deeper into the basin and is in semivirgin country.

The map is no longer blank. If things keep happening as they've been happening the past 2 years, the "n" in "blank" will fast become a "c."

Seismic-Survey Maps Help in Development

● Oklahoma operator gets results in South Lucien field with data obtained from recent surveys.

by Norman S. Morrisey
Drilling-Development Editor



OPERATORS are finding production on the south edge of Lucien field. Pay zone is the truncated edge of the Mississippian limestone and production is related to both structure and stratigraphy. Fig. 1.

SEISMIC work is a valuable asset in the development drilling program at South Lucien field, Logan County, Oklahoma. The operator, Arnold Bleyberg, Oklahoma City, coordinates the geological data from wells with a recent seismic survey to map the strat trap on the south end of the old Lucien anticline. The seismic survey gives a reliable picture of the structure and faulting; the well control gives reservoir data, pay thicknesses, subsea datum, etc. By combining the two, Bleyberg is able to stake new locations with considerable confidence.

Strat trap . . . South Lucien produces from the truncated Mississippian limestone, just at the unconformity separating Mississippian and Pennsylvanian beds. The Mississippian is completely stripped off the crest of the large Lucien structure. However, faulting has preserved the section on the south end of the anticline. (Figs. 2 and 3.)

The discovery well, the A. H. Bleyberg 1 Lynch, was originally drilled as a Wilcox test on a small seismic anomaly. The well failed to produce in the Wilcox. However, the operator ran pipe to the Mississippian because of a favorable drill-stem test that recovered free oil. The well was completed for 48 bbl. per day.

Recognizing the possibility of a strat trap, the operator reviewed the earlier seismic work. The review indicated a fairly large area on the south end of the Lucien structure that was potentially productive. Although several wells had penetrated the Mississippian on the indicated trap, none had adequately tested the Mississippian.

Drilling to date has confirmed the review interpretation; the 2 Lynch was completed for 288 bbl. per day and the 3 Lynch for 192 bbl. per day. However, it is still too early to determine the limits of production. None of the producing wells has recovered water, but the east-west fault mapped by the geophysical survey will limit production to the north.

Drilling and completion . . . Drilling at South Lucien offers few problems. The discovery well was drilled in 23 days to 5,496 ft. to the Wilcox. Subsequent wells are only carried to the Mississippian which was topped at 5,017 ft. in the discovery well. Davon Drilling Co. of Oklahoma City drilled the 2, 3, and 4 Lynch and has the contract on the fifth well in the field. Baker-Mundy Drilling Corp. drilled the discovery.

The operator normally sets pipe through the pay and completes the well through perforations. The pay zone is treated with 100 gal. of mud acid and then fractured. The usual acid treatment is 4,000 gal. of acid and 4,000 lb. of sand.

Completed wells cost approximately $10 per foot, completed into the tanks, or about $50,000 each. Gravity of the oil ranges from 43° to 46° A.P.I.

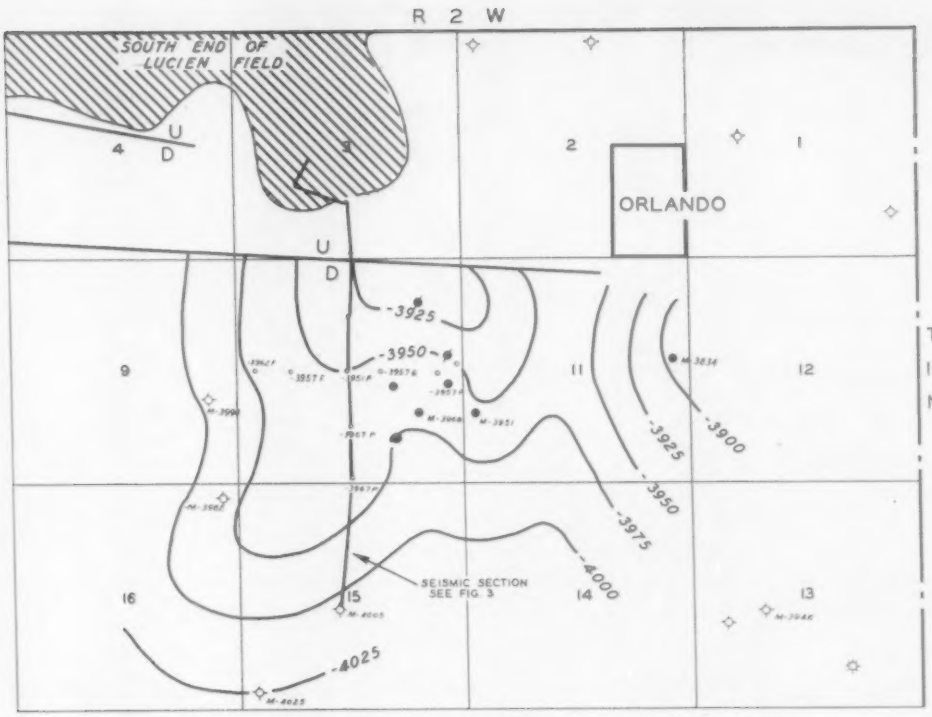
Seismic work . . . The original seismic interpretation had mapped a small anomaly at Pennsylvanian level. A detailed review of the work, however, led to the interpretation shown in Fig. 2. The fault and strong nosing were readily apparent. Cost of the entire geophysical survey was approximately $85 to $100 per shot hole.

Local and regional geology . . . The Lucien structure is a large faulted anticline that was originally drilled up during 1932. The anticline is evident on the surface beds and was mapped in 1915. L. H. Wentz drilled the discovery well at Lucien in 1932 with production from the Simpson section. On the crest of the structure, wells pass directly from Pennsylvanian beds into Ordovician rocks of Simpson age. Approximately 500 ft. of pre-Pennsylvanian beds were stripped off the structure by erosion prior to the deposition of the Pennsylvanian beds. The structure has about 900 ft. of relief in the Ordovician beds and only 320 ft. of relief in the lower Pennsylvanian formations.

A major fault lies along the west side of the Lucien field. Apparently the minor fault that trends east-west on the seismic map is related to the major fault. It is this minor fault that has helped preserve the Mississippian limestone on the downthrown or south side.

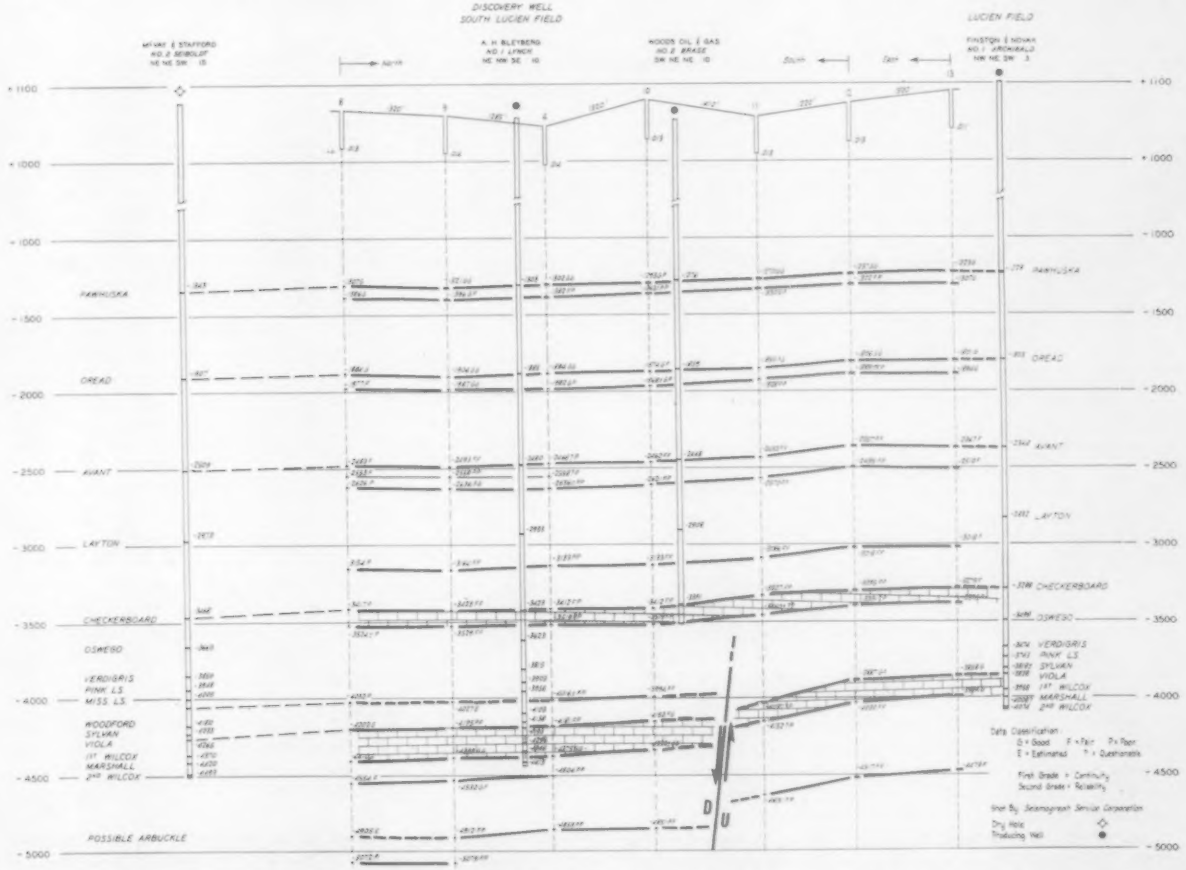
Thus the Mississippian production at South Lucien is related to both structure and stratigraphy.

Since the discovery of production at Lucien in 1932, the field has enjoyed several new drilling plays as shallower pay zones have been discovered. This new Mississippian production will help increase the output of a field that has already produced 42 million bbl. of oil.

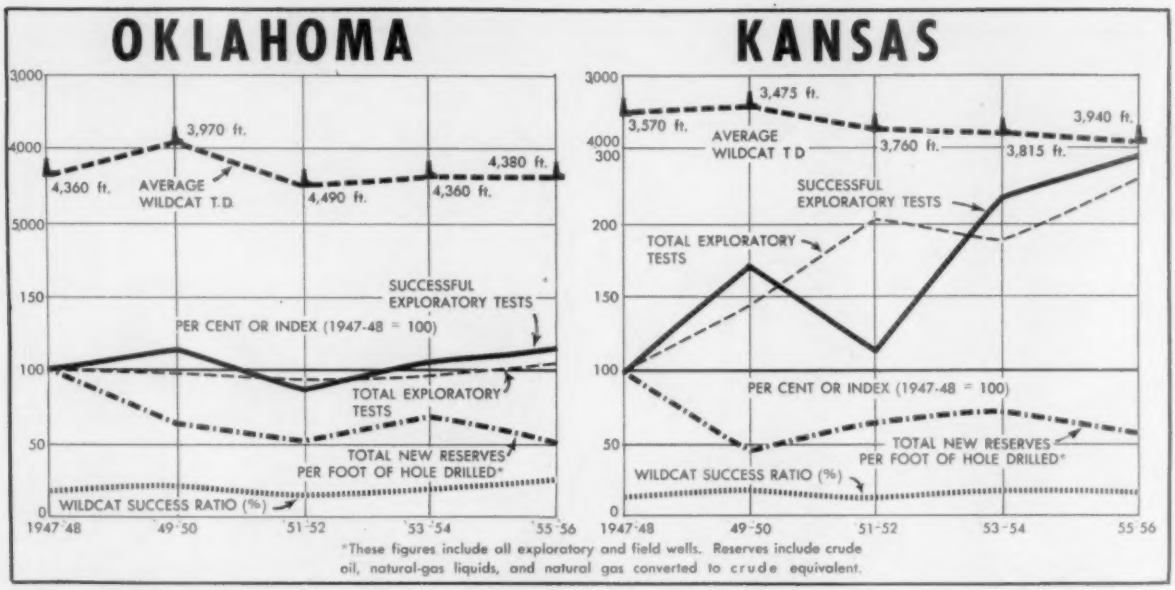


COMBINED subsurface and seismic map contoured on top of the truncated Mississippian limestone. Post-Mississippian erosion and later folding and faulting combine to trap the oil in the top of the Mississippian limestone. Fig. 2.

EDITOR'S NOTE: Since this seismic map was prepared, the operator has completed the 4 Lynch (NW NE SE Sec. 10). The top of the Mississippian in this well was 5 ft. higher than the contouring shows. This, however, is in excellent agreement with the seismic work.



COMBINED seismic and subsurface cross-section shows the effect of the post-Mississippian erosion. Producing zone is a porous limestone that is missing north of shot point 2. Fig. 3.



Mid-Continent exploration shows mixed trends as . . .

Oklahoma wildcatting remains constant

Kansas wildcatting shows marked increase

by Norman S. Morrisey
Drilling-Development Editor

OKLAHOMA'S exploratory drilling is bucking the national trend. In nearly all areas of the country, wildcatting has doubled since 1947. Oklahoma, however, has showed no appreciable increase: 1,674 exploratory tests in 1947-48 compared to 1,699 tests in 1955-56.

Development drilling (not shown on the graph) has kept pace with the rest of the country. During the 10-year period, the number of field wells has more than doubled.

Why is exploration falling off in Oklahoma? Several factors have influenced this trend:

- Probably the most important in recent years has been the impact of fracturing on exploration thinking. Today a large portion of the drilling is in and around the older producing areas where fracturing has made marginal oil reservoirs economical. The small independents are concentrating on these areas because exploration is relatively inexpensive; the hazards are low; and present state allowables make shallow and intermediate drilling more attractive financially than deep drilling.
- Some operators feel that the risks in deeper exploration do not justify the expenses. The possibility of finding large reserves, they argue, is slim.
- Present state allowables do not encourage deep exploration. Operators are faced with exceedingly long payouts, particularly when contrasted with other states.

But all is not gloomy for Oklahoma exploration. The current trend toward finding strat traps has paid off handsomely in recent years. Better seismic interpretation has led to key discoveries at North Madill, Carter-Knox and Northeast Alden.

Northwestern Oklahoma is virtually untapped. The 1956 discoveries have touched off a leasing campaign throughout all of northwestern Oklahoma. This can only mean an active wildcat program during the next 5 years.

KANSAS, long the bailiwick of the independent, is turning toward deeper drilling to bolster its reserves. The number of exploratory tests increased 2.6 times during the last 10 years: 412 in 1947 and 1,073 in 1956. And the trend is definitely toward deeper drilling for new reserves. Kansas drilling, however, still falls in the shallow and intermediate depth brackets; the average wildcat total depth in 1956 was only 3,900 ft.

Exploratory success ratios have varied widely in Kansas during the past 10 years. But over the 10-year period, one exploratory test out of six has been successful in finding gas or oil.

Until recently much of the Kansas drilling was concentrated in the Central Kansas uplift where drilling depths seldom exceed 3,500 ft.

- Now, however, Kansas oil finders are seeking strat traps and deeper prospects around the flanks of the known uplifts. The Kansas portion of the Anadarko basin is receiving considerable attention, especially for the gas reserves. Within the vast Hugoton gas field, there are excellent possibilities for deeper production, both oil and gas.
- Kansas oil finders have had considerable success in pinpointing strat traps. And there is little doubt that this emphasis on strat oil continues.
- Most of them have all the necessary requisites for production—favorable stratigraphy and structure—but development to date has not been rewarding. The Salina and Forest City basins are both good examples of what Kansas has to offer.

EDITOR'S NOTE: This is the third of a series of articles on exploration results in the United States. Next week's article will cover Louisiana, one of the nation's most promising oil areas.

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EXPLORATION HIGHLIGHTS

APPALACHIAN

OHIO

A semi-wildcat in the north central part of Knox Township, Holmes County, open flowed 2,550,000 cu. ft. natural. Diamond Oil & Gas Co. 1 Howard Wolgamot, Section 23, logged the Clinton at 3,144-57 ft., and was shut-in without treatment.

● A ½-mile extension to the production at Hermanville came in as a gasser. The C. R. Obermiller 1 P. A. Herr, Section 3, Wayne Township, Wayne County, gaged 1,000,000 cu. ft. natural and an estimated 7,000,000 cu. ft. after fracturing the Clinton, found at 3,378-90 ft.

● One of the best initial producers along the west edge of Flint Ridge field was completed by the Clinton Oil & Gas Co. on 3 C. V. Roberts, Lot 12, Hopewell Township, Licking County. Clinton sand at 3,035-86 ft. filled up 1,000 ft. while drilling in and made 600 bbl. in a 24-hour test after fracture.

PENNSYLVANIA

In Armstrong Township, Indiana County, Southwest Pennsylvania, New York State Natural Gas Corp. 1-N-522 Florence Boden et al, wildcat, elevation 1,112 ft., was successful, resulting in 5,523,000 cu. ft., gas after fracture. Onondaga 7,198 ft., chert 7,214 ft., Oriskany sand 7,352 ft., gas 7,364 ft., TD 7,381 ft.

This company's 1-N-523 C. D. Peddicord gaged 1,200,000 cu. ft., gas after fracture, Onondaga 7,474 ft., chert 7,488 ft., Oriskany sand 7,621 ft., with gas in this formation, TD 7,650 ft.

EASTERN KENTUCKY

Northeast of Sizerock and located on Left Fork of Elkhorn Creek, United Fuel Gas Co. is drilling at 3,020 ft. in the Silurian-Clinton formation at their 28 Fordson Coal Co. This test, projected to reach Cambro-Ordovician strata, topped Mississippian Big Lime at 1,630 ft. and Devonian black shale at 2,202 ft.

CALIFORNIA

Superior Scores at McClung

Superior Oil Co. successfully completed 44-33 Wesco-Clark for a new field discovery ½-mile north of the abandoned McClung field in Kern County. Superior's discovery was brought in flowing 94 bbl. daily of 33.5°-gravity crude from a Stevens sand zone at 7,698-7,720 ft. The new field is 2 miles northwest of Bellevue field and 2½ miles northeast of the Strand-Posuncula area near Bakersfield.

New Pool for Wheeler Ridge Area

Richfield Oil Corp. re-completed an earlier noncommercial Pulv sand discovery as a JV sand discovery between Wheeler Ridge and Tejon fields in Kern County. The new find, 16-30 Richfield-Mohawk, was brought in flowing 594 bbl. daily of 56.8°-gravity crude. The producing interval is 7,980-8,060 ft.

Richfield was moving in rigs to drill two more tests in this play. One will be spudded in ½-mile north of 16-30 Richfield-Mohawk and the other 1½ miles west.

Shell Gets First Pedro Pool Offset

Shell Oil Co. gave the new Pedro pool on the west edge of Santa Fe Springs field in the Los Angeles Basin its first offset. Shell brought in 29 Slusher flowing undetermined gravity crude at the rate of 408 bbl. daily. Perforations are at 9,422-10,024 ft. and between 10,088-10,148 ft. The Pedro pool was discovered last December by Edward Nepple. Nepple was running a 5½-in. combination liner in his first offset which was total depthed at 10,400 ft.

CANADA

ALBERTA

Follow-Up Well at Iroquois River Is Success

Probably the most significant happening in the western Canadian oil picture during the past 7 days was at

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a follow-up well to a previous oil discovery. The significance of this well, which was drilled by Triad Oil Co. in the Iroquois River area of northwestern Alberta, was the fact that it is the second follow-up well to indicate oil success in the granite wash horizon, in separate areas of this province. The sizable recovery of oil which was made following a drill-stem test at the Triad 9-16 Iroquois, on LSD 9, 16-75-19w5, that indicated success for this driller, is another important milestone in the present granite wash oil play. The only other granite wash find to date that has resulted in the completion of other granite wash wells in the immediate vicinity is Union's find at Red Earth Creek—also a northern Alberta find. A number of other wildcats that gave promise of production from this formation have proved to be marginal, and follow-up drilling has failed to yield further production. As a matter of fact, Triad's first follow-up to 15-16 Iroquois the discovery well in the area, drilled ½ mile west was abandoned after failing to find development in this peculiar zone.

Complete test details on the latest success, Triad 9-16 Iroquois were not released by the operator but it was reported that a test covering a 31-ft. interval below 7,812 ft. gave up 1,300 ft. of clean oil, with no evidence of formation water.

Mississippian Oil Found At Whitecourt Well

The eleventh well being drilled in the Whitecourt area of northwestern Alberta by the team of Canadian Fina Oil, Ltd., Pan American Petroleum Corp. and Hudson's Bay Oil & Gas Co., Ltd., which was staked as a D3 development driller, is turning out to be a very important venture for this prolific area. A short time ago the well, 7-5 Windfall, on LSD 7, 5-60-15w5, struck oil in the Viking sand formation. This week another surprise was uncovered, that being the presence of light gravity oil in the Mississippian horizon.

That zone, gave up 2,600 ft. of light gravity crude oil on initial test in the zone along with oil and gas-cut mud and sulfurous salt water. The next test evaluation run indicated that the pay sector had been penetrated, however, as 5,700 ft. of salt water with 200 ft. of oil and 500 ft. of gas-cut mud was recovered.

This venture lies 2 miles due west of the Fina-Stanolind-H.B. 7-3 Windfall, completed D3 wet gas success and is 5 miles southeast of the team's 15-25 Silver Creek recent D3 wet-gas discovery well. The closest previous test to this hole to indicate the presence of oil in the Mississippian was the Merrill-Cities Service 11-16 Goodwin Lake wildcat which lies 13 miles east-southeast of the new strike. It was finally capped as a potential gas well.

QUEBEC

At Bald Mountain 2 well, on the Gaspé Peninsula, the hole bridged and plugged itself 40 ft. above bottom.

After drilling through the plug to 6,618 ft., and a partial clean out, the well tested 97,000 cu. ft. of gas per day. The hole is now being readied to be shot from 6,618 ft. to 6,605 ft.

At North Shore 1 well, 1 2/10 miles south of Batiscan, 7 in. casing has been run to bottom at 2,140 ft. and is scheduled to be cemented over the next few days.

At North Shore 2 well, 2 miles south of Berthier, the hole is down to 1,245 ft., the necessary casing is being unloaded, and should be run over the next 200 ft.

At Diamond Drill Hole 1, 2 miles south of Portneuf, the hole went through 50 ft. of drift and 100 ft. of shale, and 150 ft. of 3-in. casing has been run and cemented.

ILLINOIS BASIN

ILLINOIS

Illinois Geological Society Field Conference, May 17-19

The Illinois Geological Society announces plans for a field conference to be held May 17-19, at Pere Marquette State Park in Jersey County, Illinois. The park is located approximately 23 miles northwest of Alton, Illinois on Illinois Route 100.

The geology under study will range in age from Ordovician to Pennsylvanian, with special emphasis on the oil-bearing rocks of the Mississippian.

Registration will start Friday evening, May 17 and the trip will end at noon Sunday, May 19. Registration will be limited to 150 persons. Housing accommodations for this year's trip will be handled by a reservation committee.

LOUISIANA

SOUTH LOUISIANA

Flank Extension Uncovers Deeper South Jennings Pay

Production from deep sands off the southwest flank of South Jennings field, in southeastern Jefferson Davis Parish, has been extended another half mile west by Sun Oil Co.'s third well in the area.

The new extension well, 1-A Hebert,

also proves a deeper zone than the one in which the two previous wells were completed. It is perforated at 12,680-88 ft.

Tested through ⅛-in. choke, the well flowed at the rate of 434 bbl. of 46.7°-gravity oil per day. Gas flow was measured at the rate of 1,743,000 cu. ft. per day. Flowing pressure was 7,500 psi.

Sun's initial well, 1 Miller, was completed last April with production from perforated interval at 12,356-66 ft. The second well, 1 Hebert, about a half mile northwest, was completed last October in same sand, perforated at 12,376-80 ft. The new well, best of the three in productivity, is 2,900 ft. west of 1 Hebert.

First Production Opened At "Head of the Passes"

Bateman Drilling Co., of New Orleans, is completing a gas-condensate discovery well in the "Head of the Passes" area, in the lower delta of Plaquemines Parish.

The well is the company's 2 Mark Delesdernier, which tested a flow rate through 5/64-in. choke of 3,000,000 cu. ft. of gas and 30 bbl. of condensate per day from a 57-ft. perforated interval at 6,050-6,107 ft. Flow was under pressure of 2,500 psi.

The area is at the head of Southwest, South, and Loutre passes of the Mississippi River. Location of the well is on the west side of the river, in 35-23s-31e. It is about a mile southwest of Bateman's initial test, 1 Delesdernier, completed last October as a dry hole at 12,530 ft.

Bay de Chene Completes Second 15,000-Ft. Producer

Deep development at Bay de Chene, in the coastal marshes bordering the west side of Barataria Bay, in Lafourche Parish, has resulted in another good oil producer in sands below 15,000 ft. It is The Texas Co.'s 2 State Lease 2070-St. Joseph's Bay Unit 1, on the east flank of the field, which flowed 272 bbl. of 39°-gravity oil per day through 9/64-in. choke. Pay is perforated at 15,214-26 ft. Flow was with pressure of 6,450 psi. and gas-oil ratio of 4,880 cu. ft. per bbl.

The field, which extends into Jefferson Parish, was discovered in 1941. It is associated with a large shallow, piercement-type salt dome, and produces from a multiplicity of sands ranging in depth from 1,200 ft., in Pleistocene, to below 15,000 ft., still in Miocene. The new deep producer is the second from the 15,200-ft. sand.

MICHIGAN

A wildcat located about 1 mile northwest of the Birch Run Dundee oil field, Saginaw County, logged a show of gas in the Traverse formation that spotted it as one of the more significant wildcat developments, short of completion, in Michigan this week.

This interesting test well, Foster Sayers 1 Johnson, NW SE NE 13-10n-5e, Saginaw County, logged a gas flowed estimate at 500 M.c.f. per day. Top of Traverse lime was logged at 2,007 ft. Pay was drilled between 2,017-20 ft., but failed to hold up to its initial flow rate as deepening progressed. Wildcat was being drilled below 2,150 ft., headed for Dundee, after water showed in the Traverse at 2,040-45 ft.

OKLAHOMA

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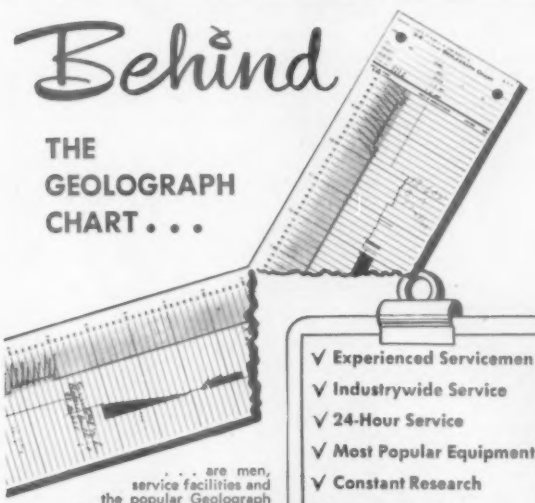

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tension Division of the University of Oklahoma in Norman, will be held in that city March 12-13 in the Oklahoma Memorial Union Building on the university campus.

The program theme is "Carbonate Reservoirs." Papers to be presented at this symposium on this theme include: "Introduction to Carbonate Reservoirs," by Dr. Carl C. Branson, director, School of Geology and Oklahoma Geological Survey; "Carbonate Reservoir Evaluation from Surveys Made in Wells Drilled with Saline Muds," by R. H. Winn, Halliburton Oil Well Cementing Co.; "Well Completions in Carbonate Reservoirs," by Dr. A. F. Beale, Jr., Dowell Incorporated; "Well completions in Limestone Reservoirs," by Walter C. Pearson, Pan American Oil & Gas Co.; "Exploring for Carbonate Reservoirs," by William J. Burgess, Sinclair Oil & Gas Co.; "The Noelke Reef in Iron County, Texas," W. E. Hall, C. S. Hill, and A. Paul Wishart, Atlantic Refining Co.; "Regional Stratigraphic Analysis of Sycamore Limestone," Jefferson Prestridge, graduate student, University of Oklahoma; "Mississippian Production in Fox Pool," David Kershisnik, Gulf Oil Corp.; "Accumulation of Oil and Gas in the Bois d'Arc Member of the Hunton Group in Central Oklahoma," Eugene F. Culp and Ed Barrett, Continental Oil Co.; "Review of West Edmond Hunton Lime Unit," L. F. Elkins, Sohio Petroleum Co.

The purpose of this meeting is to present some of the new logging techniques useful in the study of carbonate reservoirs, and to present results of research which are of value in the exploration for carbonate reservoirs and their exploitation.

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NORTHWEST OKLAHOMA

Tonkawa Well Revives West Stockholm Field

Old West Stockholm field in Harper County, Northwestern Oklahoma, has been revived at Pan American Petroleum Corp. 1 Hieronymous-B, C NE SW 3-26n-24w. The operator tested 4,000 M.c.f. of gas per day in the lower Tonkawa-Pennsylvanian sand at 5,419-81 ft. Recovery was 35 ft. of distillate.

This revival well is east of the rapidly expanding Laverne pre-Permian district. The Stockholm area was the first producing field in Harper County, and in the whole northwestern Oklahoma sector, excluding the Panhandle.

ROCKY MOUNTAIN

UTAH

Paradox Report

New locations were announced in various parts of the Paradox basin area last week. Superior Oil Co. will drill a rank wildcat 8½ miles southeast of East Aneth field near the state line of Colorado. The 1 Navajo "D," C SE NE 34-41s-26e, San Juan County, Utah, will be a Pennsylvanian try.

Offsets to important new wells in the booming Aneth trend area will be drilled by Three States Natural Gas Co. and Carter Oil Co. The Three States well will be 2 Arrowhead, NE NE SW 14-40s-23e, 1 mile southwest of the 1 Arrowhead extension in C NE NE 14-40s-23e. That well flowed 707 bbl. of oil daily on 45/64-in. choke, and was a 1-mile west stepout to Aneth field itself.

Carter Oil Co. 1-57 Navajo, NW SW SW 31-40s-23e, northeast of the Gulf Oil Corp. 1 Desert Creek-Navajo discovery in C NE NE 1-41s-22e, is another offset try. Gulf's well flowed 263 bbl. of oil per day on 12/64-in. choke. The southwest offset to this well, 2 Desert Creek-Federal, C W½ NE 1-41s-22e, flowed 86 bbl. of oil in 4 hours on tests.

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S.E.P.M. Plans Meeting

RECIPIENTS of the awards for the best paper in the Journal of Paleontology and the Journal of Sedimentary Petrology for 1955 have been announced by Robert R. Shrock, president of the Society of Economic Paleontologists and Mineralogists.

William R. Walton, Gulf Research & Development Co., Pittsburgh, will receive the award for his paper entitled, "Ecology of Living Benthonic Foraminifera, Todos Santos Bay, Baja California," published in the society's bimonthly Journal of Paleontology, Vol. 29, No. 6 (November 1955).

The Scripps Institution of Oceanography provided research vessels for the field work on this paper and the laboratory work was partly supported by the Office of Naval Research.

Louis F. Dellwig, University of Kansas, Lawrence, will receive the award for his paper entitled, "Origin of the Salina Salt of Michigan," published in the society's quarterly Journal of Sedimentary Petrology, Vol. 25, No. 2 (June 1955). This paper is a condensation of Dellwig's Ph.D. thesis at the University of Michigan.

These best-paper awards are the third to be presented by the S.E.P.M. They consist of a certificate given to the author whose paper appearing in the journals during the second preceding year is judged by the research committee to be the most outstanding contribution of that year.

Hollingsworth new S.E.P.M. president . . . Richard V. Hollingsworth, of Paleontological Laboratory, Midland, Tex., will become president of S.E.P.M. on April 4, 1957, as announced by Robert R. Shrock, president of the society. Serving with Hollingsworth on the 1957-58 council will be Robert R. Shrock, Massachusetts Institute of Technology, Cambridge, as past president; Stuart A. Levinson, Humble Oil & Refining Co., Houston, Tex., as vice president; Samuel P. Ellison, Jr., University of Texas, Austin, as secretary-treasurer; M. L. Thompson, University of Kansas, Lawrence, as editor of the Journal of Paleontology; and Jack L. Hough, University of Illinois, Urbana, as editor of the Journal of Sedimentary Petrology.

The new S.E.P.M. officers will assume the responsibility of directing this 1,300-member organization at the close of the thirty-first annual meeting of the society, which will be held at the Kiel Auditorium, St. Louis, Mo., April 1-4, 1957.

S.E.P.M. elects honorary member . . . The research committee of S.E.P.M. has unanimously nominated and the society's council has unanimously elected Henry V. Howe, Louisiana State University, Baton Rouge, as an honorary member. The honorary membership certificate will be formally presented to him at the society's thirty-first annual meeting in St. Louis, on Tuesday, April 2, 1957. His election brings the society's total honorary members to four.

Correspondent elected . . . According to the constitution of the S.E.P.M. (Article 3, Section 5), "Correspondents shall be persons not resident in North America who have made distinctive contributions to paleontology, petrology, and stratigraphy that have application to the geology of petroleum." This year the research committee has nominated and the council has elected Philip Henry Keunen to this honor.

The S.E.P.M. headquarters office mailing address is Box 979, Tulsa.

MONTANA

Additional Shows Found At Outlook Confirmation

More oil and gas shows were reported on cores last week at Amerada Petroleum Corp. 1 Loucks, C NE SW 35-36n-52e, Sheridan County. This confirmation try is 4 miles southwest of the Outlook field discovery well, 1 Tange.

The shows at the Loucks well were found in cores at 9,470-9,513 and 9,680-9,734 ft. in the Silurian. A drill-stem test at 9,655-9,734 ft. got 247 ft. of gas-cut mud and 89 ft. gas-cut muddy water with oil traces. Coring is now at 9,734 ft.

Earlier, a test in the Silurian at 9,228-40 ft. got 72 ft. of free oil and 68 ft. of oil and gas-cut mud.

NORTH DAKOTA

Beaver Lodge Report

Here are test details on Amerada's 1 Iverson-Nelson deep test at Beaver Lodge field, Williams County.

. . . Red River-Ordovician perfora-

tions at 12,846-76 ft. flowed gas at the estimated rate of 5,531 M.c.f. in 9 hours. There were 5 bbl. of oil and 1 bbl. of water with the gas. Gravity is 55.7°.

. . . Perforations at 13,470-13,510 and 13,390-13,456 ft. got gas and some oil. Flow on 8-hour test here was 2,723 M.c.f. per day with 6 bbl. of oil and 1 bbl. water.

. . . Second test of the above perforations netted 7,370 M.c.f. of gas plus 4½ bbl. water in 22 hours. Testing continues.

Amerada has another deep try under way at 9-A Unit, NW SE SW 16-156n-95w. Drilling is 5,655 ft. at this pre-Cambrian venture.

Oil Swabbed at Ward County Discovery

Ward County's first apparently commercial oil well swabbed 20 bbl. of oil per hour. The well is W. M. Hanlon and Lowell J. Williamson 1 Knudson, NE SE 7-157n-87w.

A drill-stem test at 6,732-95 ft. got 270 ft. of heavily gas-cut mud, 180 ft. of oil and gas-cut mud, and 180 ft. of gas and slightly mud-cut oil.

Testing continues at this important discovery which lies 40 miles east of Nesson anticline production.

Hanlon Drilling Co. (Billings) rig at the 1 A. O. Knudtson wildcat, 30 miles northwest of Minot in Ward County, North Dakota. The well is apparently the first commercial producer in Ward County.

IS CASING CORROSION A PROBLEM IN YOUR WELLS?

This case history tells how three companies stopped external casing corrosion on 70 of their oil and gas wells in Western Kansas. It was thought that Dakota water was the cause of most of the corrosion.

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TEXAS

WEST CENTRAL TEXAS

Ellenburger Gaged at Stonewall Discovery

Stonewall County's Cambrian prospect, which would be a new pay zone in Tompkins field, has been completed in the Ellenburger, and operators were attempting to make completion in the lower zone.

The well is J. R. McLean and J. D. Tompkins 1-A Trammell. On 24-hour gage of the Ellenburger it flowed 204.24 bbl. of 40° oil through 16/64-in. choke. Tubing pressure was 120 psi. and gas-oil ratio 451:1.

Cambrian production was indicated on drill-stem test from 5,896-5,916 ft. Four pays produce in Tompkins field. These are the Canyon, Strawn, Mississippian chert and the Ellenburger. Nearest Cambrian production is in White Flat field in northeastern Nolan County. Location of the Trammell well is 30 ft. from south and west lines of Section 135, Block 1, H&TC Survey, 10 miles south of Aspermont.

New exploration for Stonewall County included Rowan Oil Co. 2 W. Z. Rutherford, a 6,400-ft. wildcat 8 miles south of Aspermont. Location is on a 640-acre lease in Section 141, Block 1, H&TC Survey.

Cities Service Oil Co. has made application to drill 1-164 Flat Top in Section 164, BBB&C Survey, 5 miles southwest of Old Glory. Projected depth is 5,500 ft. Drill site is 2¼ miles north and slightly east of Cities Service 1-162 Flat Top, a Swastika discovery.

TEXAS PANHANDLE

Woodson Pool Opened In Hansford County

Woodson - Pennsylvanian production has been opened in Hansford County at Shamrock Oil & Gas Corp. 1 C. B. Barber, 9 miles northeast of Spearman in East Spearman-Atoka field, Section 8, Block 2, WCRR Survey.

The discovery well flowed 27 bbl. of oil per hour with gas ranging from 600 to 1,000 M.c.f. per day on test of perforations at 6,966-7,025 ft. A south offset and confirmation test has been announced at 1 Birdwell, Section 9. Top of the Atoka is 6,952 ft., Woodson pay at 6,998 ft.

TEXAS GULF COAST

Deep Wilcox Produces In Live Oak County Wildcat

Wilcox sand is proving productive in a wildcat drilled by H. R. Smith et al, of Alice, Tex., about 1½ miles southeast of Mikeska, in southeastern Live Oak County.

Completion of the wildcat, 1 Rorick Cravens, is from a casing-perforated interval at 9,774-79 ft. in hole drilled to 11,073 ft. Production is wet gas with calculated open-flow potential of 28,000,000 cu. ft. per day.

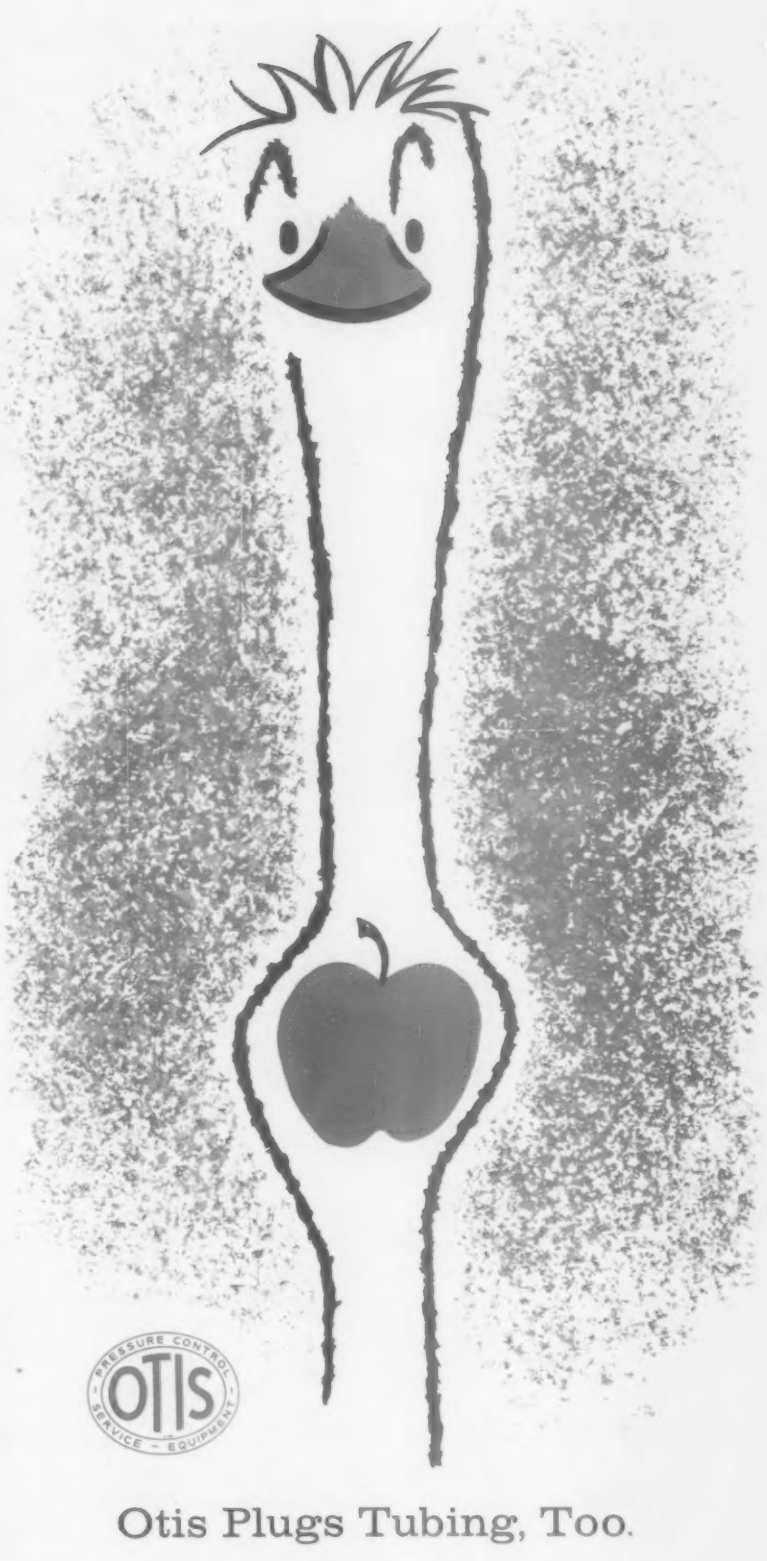
Gas carries a 49.4°-gravity liquid in the ratio of 80,130 cu. ft. per barrel. Shut-in pressure is 6,060 psi.

Second Gas Well Confirms Cameron County Discovery

Texas Gulf Producing Co. is confirming gas production it discovered in October 1955 in the Vista Del Mar area, 9 miles east of Brownsville, in southeastern Cameron County, at Texas' southeastern tip.

Confirmation well, 1 Lerma, is 4,750 ft. northeast of its discovery well (1 Vista Del Mar). It flowed gas from perforated interval at 7,376-84 ft. Gas volume was not gaged, and the well was shut in pending potential gage and completion. Total depth is 8,000 ft.

The discovery well was rated good for 10,000,000 cu. ft. of gas per day. Its pay is perforated at 7,414-26 ft. Gas is dry.



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Successful Wildcats

SOUTH LOUISIANA

East Baton Rouge Parish: Frankfort Oil Co. 1 Decker, 71-5s-1w. IP 150 BOPD, 1/8-in., 33°, TP 325 psi., perfs. 10,104-10 ft. TD 12,100 ft. (New field.)

Lafourche Parish: Gulf Oil Corp. 1-D State Lease 1423, Blk. 21, Timbalier Bay area, Gulf of Mexico. IP 404 BOPD, 7/64-in., 30.4°, GOR 724 cu. ft. per barrel, perfs. 10,615-33 ft., and (dual completion) 380 BOPD, 7/64-in., 30.6°, GOR 760 cu. ft. per barrel, perfs. 10,216-30 ft. TD 11,000 ft. (New offshore field—4 miles south of Timbalier Bay field.)

Gulf Oil Corp. 1-A OCS 0498, Blk. 128, South Timbalier area, Gulf of Mexico. IP 95 BCPD 3/16-in., 49.1°, GOR 22.4 M.c.f. per barrel, perfs. 14,352-86 ft. TD 14,638 ft. (New offshore field.)

Terrebonne Parish: California Co. 1 State Lease 774-OCS 070, Blk. 107, Ship Shoal area, Gulf of Mexico. IP 310 BOPD, 5/32-in., 36.5°, GOR 158 cu. ft. per barrel, perfs. 9,414-25 ft. TD 12,002 ft. (New offshore field.)

Southern Natural Gas Co. 2 South Shore, 51-18s-19e. IP 125 BCPD, 7/32-in., 41°, GOR 20 M.c.f. per barrel, perfs. 12,179-84 ft. TD 13,609 ft. (New field, or extension 2 miles NE of Lirette field.)

MICHIGAN

Allegan County: Ford Henry 1. Cook, SE SW SE 6-3n-17w. IPP 40 BOPD, from Traverse pay 1,696-1,712 ft. TD 1,712 ft. (New pool.)

Gratiot County: The Moco 1 Hoxie, SE SE NE 36-12n-4w. 8 BOPD from Traverse pay 2,890-95 ft. TD 2,895 ft. (New pool.)

MISSISSIPPI

Simpson County: Central Oil Co. 1 Charles Jennings, 23-2n-5e. IP 246 BOPD, 9/64-in., 45.3°, GOR 1,200 cu. ft. per barrel, TP 1,800 psi., perfs. 12,396-12,404 ft. (Bailey zone of Lower Cretaceous-Sligo). TD 12,691 ft. Elev. 430 ft., Lower Cretaceous 8,748 ft., base of Anhydrite 11,518 ft. (Discovery well of Martinville field.)

MONTANA

Musselshell County: Texota Oil Co. 1 Goffena, C NW NE 26-9n-27e. IPF 428 BOPD, Amsden discovery, new field. TD 6,309 ft. Amsden.

NEBRASKA

Cheyenne County: John McKnab 1 Rabbass, C NW NW 23-15n-52w. IPP 275 BOPD, "J" sand discovery, new field. TD 5,375 ft. Skull Creek.

Kimball County: Balderson Drilling Co. 1 Schmid, C NE NE 26-16n-57w. IPP 75 BOPD, "D" sand discovery, new field. TD 6,092 ft. "J" sand.

SOUTHEAST NEW MEXICO

Lea County: Magnolia Petroleum Co. 1 Dickinson heirs, 33-10s-36e. IP 151 BOPD, 3/4-in., TP 75 psi., GOR 2356, 43°, Pennsylvanian perfs. 11.504-17, 11,524-31 ft. TD 12,690 ft.

NORTHWEST NEW MEXICO

Rio Arriba County: Skelly Oil Co. 6 Jicarilla "C," SE NW SE 27-25n-5w. IPF 60 BDPD, 1,569 M.c.f. of gas per day, Dakota discovery, new pay. TD 7,370 ft. Morrison.

San Juan County: Haynes, V. T. Drilling Co. 1 Federal-Sapp, C NE NE 28-24n-8w. IPP 108 BOPD, Point Lookout discovery, new field. TD 5,480 ft. Gallup sand.

NORTH DAKOTA

McKenzie County: Northern Pump Co. 2 G. T. Rhode, C NW SE 17-152n-94w. IP swabbed 361 BOPD, Madison discovery, new pay. TD 9,260 ft. Nesson.

OKLAHOMA

Beaver County: Lynn Drilling Co. 1 Williams, SE SE NW 32-1n-20eCM. IPF 428 BOPD, 39°-gravity, Morrow sand 7,276-81, 7,285-7,307 ft. TD 7,360 ft.

Tennessee Gas Transmission Co. 1 Overton, C SW NE 6-3n-26eCM. IP 16,929 M.c.f. of gas per day, Morrow 7,190-7,215 ft.; Chester 7,373-90 ft., 7,398-7,403 ft., 7,407-16 ft. TD 7,473 ft. New pay in unnamed field—Chester.

Shell and Cabot Carbon 1 Barby Unit, C NW SE 6-3n-28eCM. IP 4,015 M.c.f. of gas per day, Hoover 4,350-4,410 ft., Chester 7,185-95 ft. TD 7,400 ft. New pay—Chester—in NW Highland field.

Cleveland County: Oil Capitol Corp. 1 J. H. Allen, SE SE NE 32-8n-1w. IPF 128 BOPD, 37° gravity. Bromide sand 7,470-71 ft. TD 8,302 ft.

Garvin County: Superior Oil Co. et al 1 Milburn Unit, 3-1n-3w IPF 72 BOPD, 47.4° gravity. 1,000 M.c.f. of gas per day, McLish 9,910-72 ft. TD 13,103 ft.

Grant County: Seneca Oil and Aberdeen Petroleum Co. 1 B. F. Yerian, C NW SE 35-28n-7w. IPF 18 BOPD, 41° gravity. Mississippian 5,002-18 ft. TD 5,065 ft.

Harper County: Eason Oil Co. 1 Price, C NE SW 21-26n-23w. IPF 131 BOPD, 43° gravity. Lower Tonkawa 5,490-92½ ft. TD 7,150 ft.

Woods Petroleum Co. and Phillips Petroleum Co. 1 May Seevers, C NW NW 6-27n-20w. IPF 24 BDPD, 7,300 M.c.f. of gas per day, 53.7°. Viola 6,965-89, 6,996-7,010 ft. TD 7,628 ft.

Kingfisher County: Big Chief Drilling Co. 1 Koch, NE NE SE 35-18n-5w. IPF 4 BOPD, 10 per cent water, 43°, Mississippian 6,397-6,423 ft. TD 6,423 ft.

Okfuskee County: Ben J. Taylor 1 Harjo, C E½ NW NE 14-10n-8e. IPF 3,000 M.c.f. of gas per day, 12 BOPD, second Gilcrease sand 2,882-90 ft. TD 3,188 ft.

Fourdee-Rhoades Oil Co. and T. E. Williams 1 Kelly, SW NE NW 29-12n-9e. IPP 80 BOPD, 30° gravity. Gilcrease sand 3,280-99 ft. TD 3,305 ft. New pay in NW Castle pool.

Osage County: Jernigan & Morgan 1 Osage, NE SE NW 20-25n-5e. IPP 19 BOPD, 161 BW, 34°, Osage Layton 2,176-82 ft. TD 2,187 ft.

Pottawatomie County: E. J. Lavine and Headington Brothers 1 Mikish, SE SW SE

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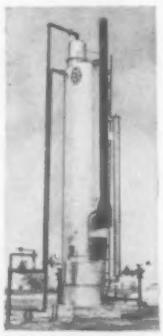

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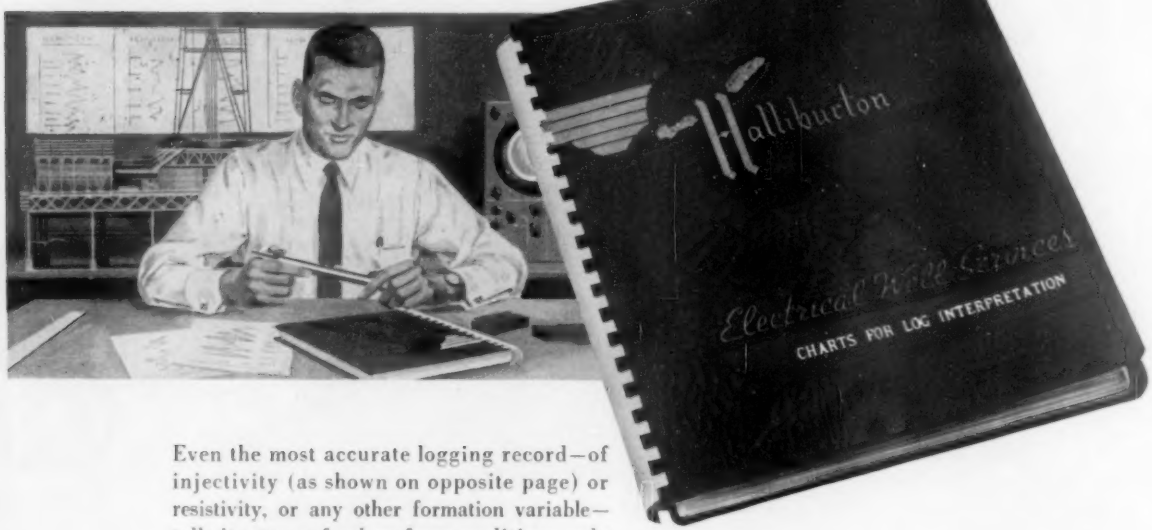
Every log is a riddle until INTERPRETATION GETS THE ANSWER



Even the most accurate logging record—of injectivity (as shown on opposite page) or resistivity, or any other formation variable—tells its story of subsurface conditions only after interpretation has taken the "riddle" out of it. For that reason, oilmen who appreciate getting the clearest, simplest presentation of the facts that ingenuity has been able to devise, ask Halliburton to log their wells. In the Halliburton tradition of clarifying the subject of well logging, every field engineer for Halliburton Electrical Well Services is not only trained to interpret a log of your well by latest methods, with competence, thoroughness and ingenuity. But equally essential, he is prepared to present the information in everyday language. And to show you with easy-to-use graphs and tables just how the interpretation is performed. That's because the aim of Halliburton logging is to make easily available to each oilman the priceless knowledge of the true potential profit and loss conditions in the formations under his lease.

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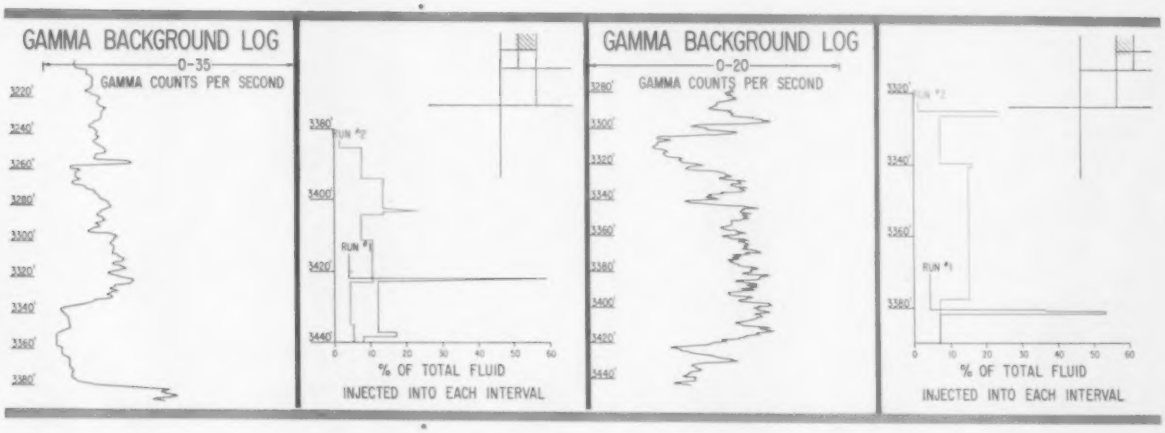
WATER INJECTION PROFILE GETS "FACE LIFTING"

Here's a revealing example of how oilmen are improving their field operations by pairing up more than one of the helpful, cooperative Halliburton oil well services.

In these two adjacent water injection wells, preliminary Halliburton Isoflow Logs showed that the flood water was entering only the lower part of the productive section.



A Halliburton Blox-All treatment was performed on each well, with the Isoflow tool still in the hole. The Blox-All, a self-gelling fluid, had been mixed with a radioactive isotope. Guided by the Isoflow tool's detection of the radioactive interface, the fluid flow down tubing and annulus was controlled to inject the Blox-All into the "thief" zone. After a post-setting treatment with acid, Isoflow surveys were run again to check results.

A glance at the "before" (black curves) and "after" (red curves) injection profiles tells the successful outcome of this typical teamwork of Halliburton services. A Halliburton Electrical Well Services field engineer will be glad to discuss your injectivity or other subsurface problems with you.

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ELECTRICAL WELL SERVICES

26-10n-4e. IPP 43 BOPD, 32°, Earlsboro 3,965-72 ft. TD 3,972 ft. New pay in West King pool.

Payne County: Powel Briscoe 1 Randolph, SE NE SE 11-19n-1w. IPF 3 BDPD, 53° gravity, 4,250 M.c.f. of gas per day, Skinner 4,505-13 ft. TD 5,029 ft. New pay in East Orlando field.

Woods County: Gulf Oil Corp. 1 Shade, C SE SW 31-25n-14w. IPF 51 BOPD, 54 BW, 33°, 154 M.c.f. of gas per day, Misener-Hunton 7,118-28 ft. TD 8,000 ft.

PENNSYLVANIA

Indiana County, Armstrong Township: Peoples Natural Gas Co. 4108 Harry L. George, wildcat, elevation 1,306 ft., gaged 4,800,000 cu. ft. gas after fracture. Chert 7,443 ft., Oriskany sand 7,578 ft., gas 7,579-87 ft. TD 7,607 ft.

Indiana County, Armstrong Township: New York State Natural Gas Corp. 1-N-522 Florence Boden et al, elev. 1,112 ft., 5,523,000 cu. ft., gas after fracture, Onondaga 7,198 ft., chert 7,214 ft., Oriskany sand 7,352 ft., gas 7,364 ft. TD 7,381 ft.

New York State Natural Gas Corp. 1-N-523 C. D. Peddicord, 1,200,000 cu. ft., gas after fracture, Onondaga 7,474 ft., chert 7,488 ft., Oriskany sand 7,621 ft., gas TD 7,650 ft.

SOUTHWEST TEXAS

Duval County: Head-Welsh 1 Damaso Vera, Share 4 Garrera Grant, A-208 (12 miles southeast of Benavides). IP 8.35 BOPD net), water 89 per cent, open tubing, 22°, perforations 3,188-93 ft. TD 4,533 ft. (New field.)

Jim Wells County: Katz Oil Co. 2 Dunn, Blk. 50, Diberll Subd., Wade Ranch (2 miles E of Sandia). IP 4,300 M.c.f. daily, open-flow potential, GOR 806.5 cu. ft. per barrel, 57.8°, perfs. 3,741-46 ft., and (dual completion) 27,500 M.c.f. daily, open-flow potential, GOR 233.1 M.c.f. per barrel, 54.8, perfs. 5,682-87 ft. TD 5,818 ft. (New field.)

San Patricio County: S. H. Howell 1 Stahl, Section 58, George H. Paul Subd. (2 miles southwest of Taft). IP 165.41 BOPD, 5/32-in., 42.5°, GOR 920 cu. ft. per bbl., perforations 6,138-42 ft., and (dual completion) 143 BOPD, 9/64-in., GOR 1,670 cu. ft. per bbl., perforations 6,176-80 ft. TD 8,616 ft. (New field—La Valla "B" sand.)

EAST TEXAS

Navarro County: The Texas Co. 1 J. N. Edens, James Smith Sur., A-276, 2 miles W Powell field, 2½ miles N Navarro. IP, open flow, 18,500 M.c.f. gas, plus 20 bbl. 61.8° distillate per 1,000 M.c.f., Smackover perfs. 8,730-70, 8,869-90 ft., GLR 50,725:1. Elev. 435 ft., top pay 8,730 ft.

NORTH TEXAS

Cooke County: Burk Royalty Co. 1-A Wilson "D," B. Sullivant Sur., A-581, 6 miles E Gainesville. IP 187 BOPD, ½-in., TP 150 psi., 38°, GOR 600, Strawn 3,970-80 ft. TD 4,116 ft.

Jack County: Fletcher Oil & Gas Drilling Corp. 1 Prideaux, W. Thompson Sur., A-608, 1 mile W Jacksboro. IP 46 BOPD, 12/64-in., TP 775 psi., 44°, GOR 3300, conglomerate 5,128-29 ft. TD 5,157 ft., top pay 5,118 ft.

Midland Oil Corp. 1 Catlin, Wm. Perrin Sur., A-989, 4½ miles S Newport. IP 75.5 BOPD, 14/64-in., TP 90 psi., 41.8°, conglomerate 5,720-35 ft.

Knox County: Ray Smith Drilling Co. 1 Hill, S. Washburn Sur., A-410, 3 miles SE Munday. IPP 42 BO in 12 hours, plus 2 bbl. water per day, 37°, Tannehill sand 1,773-93 ft. TD 2,050 ft.

Wise County: Christie, Mitchell & Mitchell 1 Halman, G. W. Cash Sur., A-166, 4½ miles NW Chico. Recompletion. Old TD 6,015 ft., PB 5,754 ft. Top conglomerate pay 5,660 ft., IP 146.8 BOPD, ¼-in., TP 280 psi., GOR 996.

Christie, Mitchell & Mitchell 2 Lawrence, ACH&B Sur., A-23, 6½ miles W Chico. IP 169 BOPD, 14/64-in., TP 550 psi., GOR 892, conglomerate 5,746-56 ft. TD 5,796 ft.

TEXAS GULF COAST

Chambers County: Kilroy Oil Co. of Texas and F. A. Callery, Inc., 1 Smith, Anson Taylor Sur. IP 16,000 M.c.f. daily, open-flow potential, GOR 56 M.c.f. per barrel, 55.8°, perfs. 9,032-42 ft., and (dual completion) 19,500 M.c.f. daily, open-flow potential, GOR 52 M.c.f. per barrel, 58°, perfs 8,992-9,000 ft. TD 9,208 ft. (New pay in Double Bayou field.)

Hardin County: Ada Oil Co. 1 Kinsolving, P.A. Work Sur., A-600 (8½ miles N of Kountze). Shut-in gas well, no gage, perfs. 7,168-75 ft. TD 7,310 ft. (New field—1½ miles SW of North Beech Creek field.)

Fayette County: E. R. Austin and A. B. Cauklin 1 Waldemar Hassler, J. Rice Jones League (7 miles NE of Fayetteville). Shut-in gas well, no gage, TD 268 ft. (New field.)

Harris County: David L. Gordon 1 Straus, Simon Contreras Sur., A-220. IP 8,000 M.c.f. daily, open-flow potential. GOR 89.2 M.c.f. per barrel, 58.5°, perfs. 7,244-60 ft., and (dual completion) 6,000 M.c.f. daily, open-flow potential, GOR 94 M.c.f. per barrel, 54.9°, perfs. 7,518-28 ft. TD 7,544 ft. (New pay in Durkee field.)

Jasper County: Atlantic Refining Co. 1 H&TC Fee 75, H&TC Sur. 75, A-282. IP 85.5 BOPD, 7/64-in., 42.3°, GOR 682 cu. ft. per barrel, perfs. 7,593-96 ft., and (dual completion) 183 BOPD, 5/32-in., 42.4°, GOR 501 cu. ft. per barrel, perfs. 7,986-91 ft. TD 8,506 ft. (New field—2 miles NE of Buna.)

Newton County: Atlantic Refining Co. 1 J. D. Ray Fee, John D. Ray Sur., A-13 (6 miles SE of Call). IP 168.02 BOPD, 9/64-in., 48°, GOR 1,459 cu. ft. per barrel, perfs. 7,413-17 ft., and (dual completion) 115.38 BOPD, 7/64-in., 50°, GOR 3,960 cu. ft. per barrel, perfs. 7,561-64 ft. TD 8,305 ft. (New field.)

WEST VIRGINIA

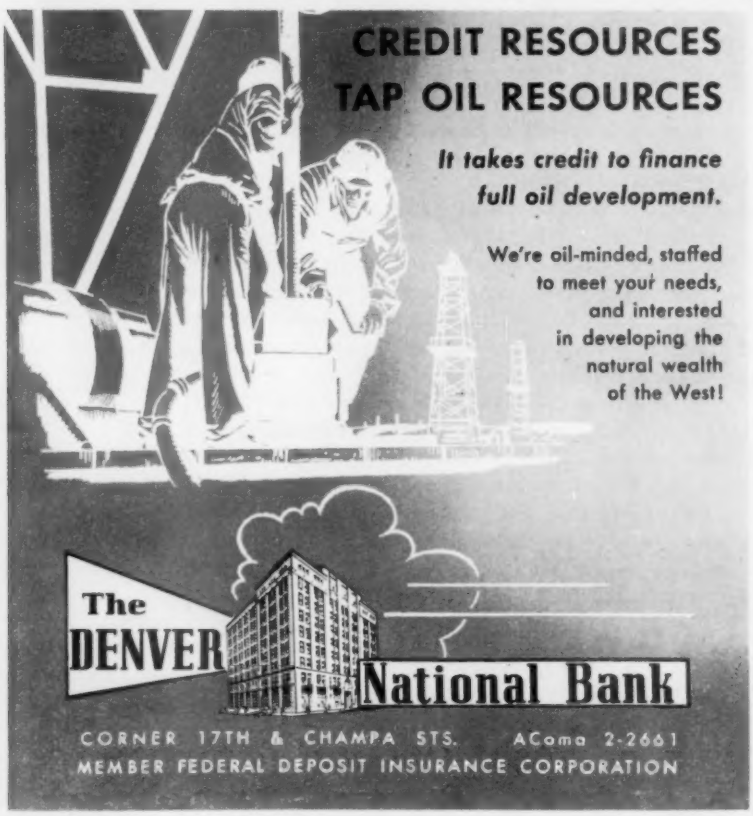
Tucker County, Licking district: Hope Natural Gas Co. 10009 Thaddeus Pritt wildcat, elevation 3,385 ft., had a final gage of 6,472,000 cu. ft. gas after fracture, chert 4,232 ft., Oriskany sand 4,420-4,523 ft., gas 4,464-69 ft., Helderberg 4,523 ft., gas 4,553 ft. TD 4,626 ft.

WYOMING

Big Horn County: Victor Ziegler 1 Government, NE NE NE 7-54n-93w. IPP 5 BOPD, Amsden discovery, new pay. TD 1,385 ft. Amsden.

Niobrara County: National Cooperative Refinery Association 3 NCRA Unit, SE NW NE 2-39n-61w. IPF 1,680 M.c.f. of gas per day, first Leo sand discovery, new pay. TD 2,774 ft. Mule Creek.

Sublette County: John L. Kemmerer 2-A Government, NE NE NW 33-27n-112w. IPF 4,500 M.c.f. of gas per day, second Frontier sand discovery, new field. TD 7,590 ft. Second Frontier.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BLACK LIGHT...new way to check SPANG® quality!

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(*Continued on next page*)

the pipe, accurately scanning every square inch—looking for telltale accumulation of glowing particles which indicate surface flaws. If any are found, special chalk marks (see below) locate the defective spots.

This quick description identifies one of the largest and most efficient inspection units for magnetic particle detection of surface defects in pipe used in any plant today.

Such new equipment is but one of the many special steps we take to continuously improve the high quality of SPANG tubular products. It is also a way we can assure ourselves that the SPANG products you put in your well are the finest available.

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The secret of SPANG Drill Pipe's high resistance to fatigue and tension failure is simple—high quality manufacturing standards at the mill.

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Contractors have found this SPANG quality to be an exceptionally profitable advantage in every kind of drilling operation. Why not gain this profit by talking over your drill pipe requirements with National soon?

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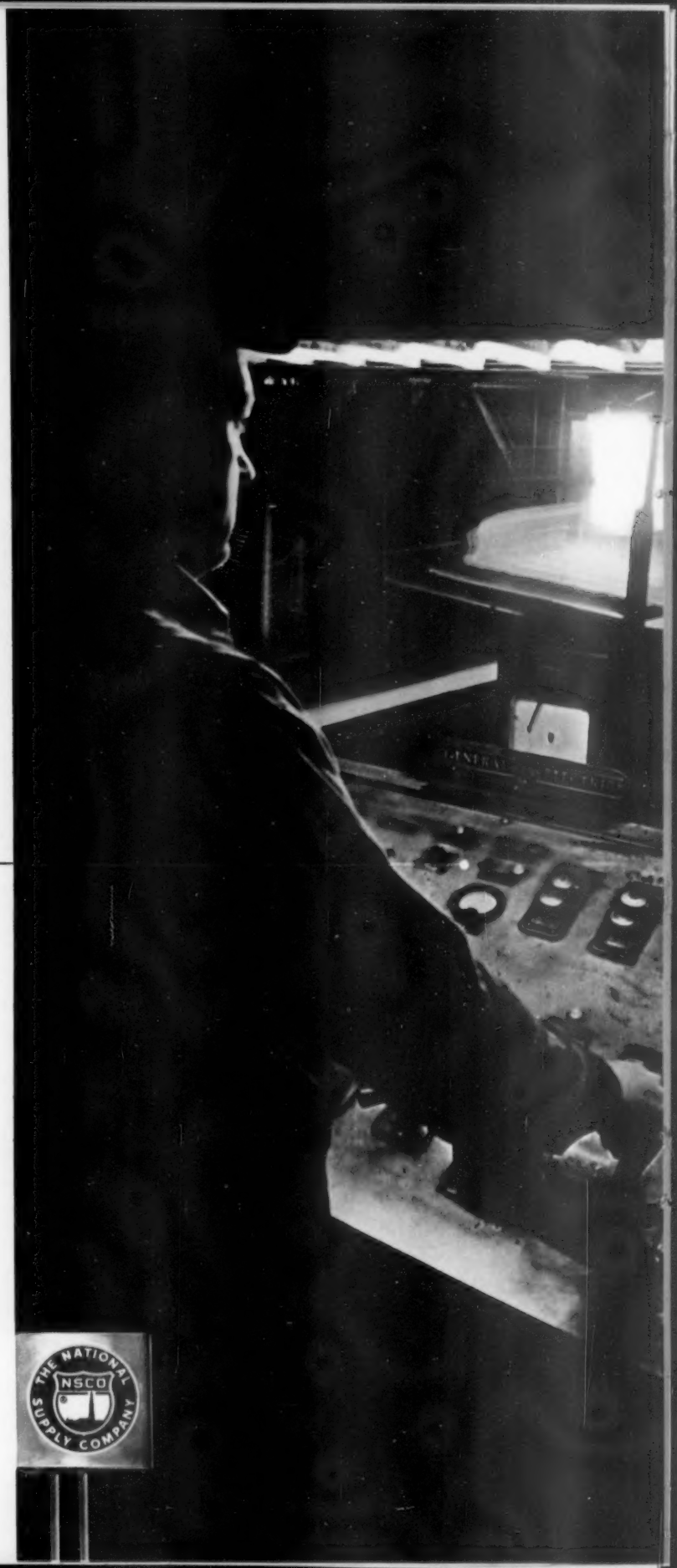
DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Fort Worth, Texas; Los Angeles, California; Toledo, Ohio; Tulsa, Oklahoma; Calgary, Alberta, Canada

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT



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NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

Maybe the Old Timers' Ideas On Creekology Meant Something

. . . Discussion set for A.A.P.G. meet

PHOTOGEOLOGISTS are falling back on creekology as an aid in finding new oil fields. Unusual drainage patterns in an unexplored area may be the tipoff to an oil-bearing structure. Geologists are using aerial photos and geomorphology to guide exploration in areas where the surface geology is obscured by river gravels or alluvium. Humble Oil & Refining Co. geologist, Robert Lawson Kite, will discuss this new technique at the forty-second annual meeting of the American Association of Petroleum Geologists, April 1-4, in St. Louis.

Kite and his associates with Humble classify stream and river patterns into eight basic types, although there are a wide variety of unusual patterns. And Kite demonstrates that at least one of these basic types can be used as a guide in contouring the underlying geology. Aerial photos provide an excellent reconnaissance method in this new application of creekology.

Back in the early days of oil exploration, the uneducated wildcatters placed great faith in creekology as a guide in exploring for oil. Now science backs up their basic ideas and shows how the stream patterns can aid the oil finders. Kite explains that the streams running over alluvium or gravel-covered areas are extremely sensitive to even minor warping or fracturing of the underlying rocks.

This warping causes changes in the stream patterns that are directly related to the underlying geologic structure. This structure, in turn, provides the necessary clue to the possibility of a new oil field. Actually Kite explains creekology in terms of geomorphology. Simply stated, geomorphology is the relationship between the shape of the land surface and the stream patterns to the geology of the area.

Kite, now a resident of Houston, is a native of Wyoming. He is a photogeologist with the geologic research section of Humble Oil & Refining Co. He is a graduate of the University of Kansas with a degree of bachelor of science in geological engineering, graduating in 1950. He took graduate work in geology at the University of Illinois and acquired his master of science degree in geology from Victoria University College, Wellington, New Zealand, in 1952, as a Fullbright exchange scholar.

R. L. KITE
. . . Speaker for A.A.P.G.

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"From here on, it's all down hill."

Stanley's latest big deal . . .

. . . Last Gas Frontier Is Crossed

FLOYD E. STANLEY, Tulsa contractor and promoter, is true to the pipelining breed to which he belongs.

He has the contractor's independence and gambling spirit, the promoter's imagination and tenacity. And all these traits were evident in his promotion of a $150-million gas line which will stretch 1,517 miles from McAllen, Tex., to Miami, Fla.

A Clint Murchison firm, Coastal Transmission Corp., will gather the gas from the Mexican border to Louisiana and transport it to Baton Rouge. Houston Texas Gas & Oil Corp., which Stanley heads as president and chairman, will take the line on to Miami.

Stanley, a cattleman as well as a pipeliner, more than 2 years ago saw the possibilities of the last major U. S. market still without natural gas. And he stuck with the project which most observers foredoomed to failure until it emerged from the Federal Power Commission maze.

It was fitting that Stanley head the project that will cross the last gas frontier. For he helped promote another modern big-inch, high-pressure, cross-country gas line. This was the Texas Illinois Natural Gas Pipeline from the Gulf Coast to Chicago.

Special problems . . . With Texas Illinois, there was an established market. There was an established need through waiting lists of applications for gas service.

"In Florida," Stanley points out, "it was different. Natural gas and long-term contracts were foreign. We needed a year to acquaint customers with the problems of the regulated natural-gas industry."

Then there was the job of persuading producers—recently placed under FPC control—to dedicate reserves to the first major line put together with U. S. reserves since the Phillips decision.

Having a project of doubtful future, however, was not without its advantages. By the time potential competitors woke up, the plan was already before the FPC. And it was too late to file a competing application that would hold up.

Project development . . . Stanley took over direction of Houston from the late J. O. Mack, whose own efforts to promote this line—among others—were stymied late in 1954.

After studying a new market survey which revealed Florida's postwar growth (population increased 36 per cent in 6 years), Stanley agreed to become chairman of Houston. He set forth one condition:

F. E. STANLEY
. . . "In Florida it was different."

"I told Mack there was only one man I would tackle this with—Ted Rinehart." He was willing to wait 6 weeks for Theodore Rinehart, Tulsa and Washington attorney and natural-gas expert, to say yes.

Soon afterward the project began to jell. Rinehart went to work on the market. Several major producers agreed to release their gas. Houston arranged with Coastal to handle the supply in February 1955. And the supply and market were soon joined.

"It all fell together when the user-producer sales contracts with two power companies were made," Stanley says. "They were the key, the backbone of the project, the means of getting the big industrial load that made the project feasible."

Under the unique contracts the utilities buy gas directly from producers at a competitive price—pegged to stay below fuel oil. The utilities got a stable, long-term fuel supply and producers will receive a good price—18½ to 21½ cents per M.c.f.

But their troubles were far from over. The FPC's ruling approving the project set forth conditions which commissioners doubted could be met. But they were met last month.

Stanley minimizes his own role in the project and attributes its success to a team effort. He worked closely with W. J. Bowen, president of Coastal. Other members of the team, besides Rinehart, were O. Paul Herzig, Houston engineer; John M. Harbert, Harbert Construction Corp., Birmingham; C. C. Barnard, of Barnard & Burk, Baton Rouge market consultants; Eugene Bashore, Blyth & Co., New York; Jim Roddy, Scharff & Jones, New Orleans, and Paul Wallack, Tulsa.

Career . . . A registered professional engineer, Stanley studied industrial engineering at the University of Oklahoma and Oklahoma A & M. At A & M he shared an apartment with C. C. Bledsoe, whom he remembers as a "lousy cook" in their college days but who later became his partner in Midwestern Constructors, Inc.

Stanley gained experience in all phases of design, construction, and operation in the late 1920's and early 1930's. He held responsible jobs with Cities Service Gas Co., Texas-Empire Pipe Line Co., Continental Construction Co., Natural Gas Pipeline Co. of America, and Sheehan Pipeline Construction Co.

Since 1938, when he organized and became president of Midwestern Constructors, his firm has built 8,000 miles of pipelines. He had spreads on the War Emergency Pipeline (both Big and Little Inch) and many other major cross-country lines.

He was the only contractor on El Paso Natural Gas Co.'s first line to California. And he built 450 miles of Trans Mountain Oil Pipe Line Co., the crude system from Edmonton, Alta., to Washington across the Canadian Rockies, known as the world's toughest pipeline job.

Stanley has organized sales, contract drilling, and construction companies with employes who were willing to gamble with him. He later sold his interest, leaving them with going enterprises of their own.

Coles S. Tinkler, senior landman for Sinclair Oil & Gas Co.'s Midland, Tex., division, has been promoted to exploration superintendent there. Tinkler has been with Sinclair since 1940.

John W. Bell, Jr. has been elected 1957 president of the Southwest Louisiana Geophysical Society. Bell is with Pan American Production Co. in Lafayette, La. **A. V. Hargis,** Arkansas Fuel Oil Corp., Lafayette, has been elected first vice president. **W. W. Daly,** Forest Oil Corp., Lafayette, is second vice president, with **Lawrence Ott,** Tidewater Oil Co., Lafayette, as secretary-treasurer.

Basil P. Kantzer, manager of Union Oil Co.'s gulf division, has been elected a vice president.

Edward M. McGuire, production engineer with Cities Service Oil Co. in Odessa, Tex., has been promoted to district petroleum engineer in Pampa, Tex.

Frank Pyle, works manager at Spencer Chemical Co.'s Orange, Tex., plant, has been elected a vice president of the company and transferred to Kansas City.

Delmar Cox, assistant production superintendent for Sun Oil Co. in Yale, Okla., has joined Blackwell Oil & Gas Co. as district engineer in Cushing, Okla.

Charles E. Hipp, Jr., of Edward Hipp Well Servicing Co., has been elected president of the newly formed North Texas chapter of Association of Oilwell Servicing Contractors.

Vernon Redd, superintendent of Magnolia Pipeline Co.'s Olden, Tex., district office, has been transferred to Abilene, Tex., in a move which will change location of district headquarters.

R. B. Dummett has been elected a director of British Petroleum Co., Ltd., succeeding **B. R. Jackson,** who has resigned. Dummett joined B.P. in 1936. His most recent post was manager of the company's Australian marketing organization.

Charles Swoope, assistant general superintendent of Esso Standard Oil Co.'s Bayonne, N. J., refinery, has been appointed general superintendent. He succeeds **Dave Edwards,** who was recently made plant manager. Swoope has been with Esso since 1928. He was head of the East Coast technical service division before going to Bayonne as assistant superintendent.

Bill Sheridan, assistant general superintendent of Esso Standard Oil Co.'s Bayway refinery, Linden, N. J., has been appointed administrative superintendent. **Bud Bigelow,** head of the mechanical department, has been named operations superintendent. **Fred A. Westphal,** assistant head of the mechanical department, will succeed Bigelow. The changes are in line with recent reorganization of top management positions at Bayway. Sheridan has been with Esso since 1941 and at Bayway since 1955. Bigelow joined Esso in 1935 as a student engineer. He has been head of the mechanical department since 1955. Westphal joined the company in 1952 as assistant regional engineer.

JOHN E. BRANTLY
... Winner of A.I.M.E.'s Lucas award.

A.A.O.D.C. Founder Honored

The founder of the American Association of Oilwell Drilling Contractors last week was awarded the Anthony F. Lucas medal. The award is one of the highest honors bestowed by the American Institute of Mining, Metallurgical and Petroleum Engineers.

The recipient, John E. Brantly, of Cocoa, Fla., was at one time chief foreign geologist for Atlantic Refining Co. In 1929 he founded Drilling and Explorations Co., which had worldwide operations when he retired in 1952.

Brantly was cited "for contributions to the art of drilling; for technical writing, including the Rotary Drilling Handbook, and for leadership in the petroleum industry, notably in founding the American Association of Oilwell Drilling Contractors."

Mohamed Mortada, Dallas, senior engineer for Magnolia Petroleum Co., also was honored for his technical writing. He received the Rossiter W. Raymond award for his paper, "A Practical Method for Treating Oilfield Interference in Waterdrive Reservoirs."

P. T. Martin, manager of production for Hancock Oil Co., has been elected vice president for production. **B. H. Dresser** has also been named a vice president.

Robert A. Bainter, assistant superintendent of Wyoming-Nebraska Pipe Line Co., has been appointed superintendent. **Earl R. Ferguson,** supervisor of the company's Sidney, Neb., terminal, has been named assistant pipeline superintendent, and **Robert E. Fleenor,** terminal operator, will succeed Ferguson at Sidney.

Personals

John R. Cox, formerly with Midstates Oil Corp. in Wichita, has opened consulting offices there.

R. F. Nelson, division mechanical engineer for Shell Oil Co. in Wichita Falls, Tex., has been named production engineer in Tulsa.

V. L. Kuehn and **S. B. Roberts,** Abilene, Tex., independent operators, have formed Kuehn & Roberts Drilling Co. in Abilene.

O. B. Trotter, New Orleans drilling contractor and independent operator, has been elected a director of Chemoil Corp.

Robert W. Brumberg, reservoir engineer with Ohio Oil Co. in Casper, Wyo., has joined Midwest Oil Corp. as reservoir engineer in Denver.

Donald R. Nafus has been appointed project supervisor of quality control for Husky Oil Co. in Cody, Wyo. Nafus joined Husky in 1950 as a research chemist.

Harry S. Lain, district geologist for Seaboard Oil Co., has been promoted to coordinating geologist and transferred to Dallas from Amarillo, Tex. **John Griesbach,** geologist at Oklahoma City, will replace Lain at Amarillo.

S. G. Sanderson, Tulsa production division manager of Gulf Oil Corp., has been elected vice president to head the production department. Sanderson joined Gulf in 1913. He later headed the natural-gas department at Shreveport, La., was superintendent of natural-gasoline plants in Tulsa, and general superintendent of Gypsy Oil Co., then a Gulf subsidiary. He became manager of production for the Tulsa division in 1952 and division manager last April.

John A. Masters has been named head of the new Calgary exploration office of Kerr-McGee Oil Industries, Inc. Masters has been manager of uranium exploration for the company. A graduate of Yale University, he joined Kermac in 1953. **Gerald C. Loucks** and **Robert L. Duncan** have been appointed district geologists in Calgary. Loucks was formerly with Skelly Oil Co. and Duncan was with The California Co.

Personals

L. E. Davis has been appointed general superintendent of operations and construction for Marine Gathering Co.,

M. I. McGOWAN

L. E. DAVIS

and **M. I. McGowan** has been appointed chief engineer. Marine Gathering is a subsidiary of Commonwealth Oil Co. Davis was with McCarthy Chemical Corp. before joining Marine Gathering in 1954. He was also with Pure Oil Co. and Humble Oil & Refining Co. at one time. McGowan joined Marine Gathering in 1956. He was formerly with Tellepsen Petro-Chem Constructors, Mathieson Chemical Co., and McCarthy Chemical Corp.

Arden Blair, formerly geologist with George J. Greer in Denver, has resigned to open consulting offices in Billings, Mont.

Marly D. Stewart, engineer with Sinclair Oil & Gas Co., has been appointed production engineer and transferred to Silsbee, Tex., from Tulsa.

G. SYMONDS

Gardiner Symonds, president and a director of Tennessee Gas Transmission Co., has been elected a director of Southern Pacific Co. Symonds succeeds the late Everette L. DeGolyer on the railroad's board. Symonds has been president of Tennessee Gas Transmission since it was organized in 1943. He also is a director of the Petro-Tex Chemical Corp., Trans-Canada Pipe Lines, Ltd., and several other companies.

Esso Research & Engineering Co. has elected five new directors. They are **L. J. Brewer,** president, Esso Standard, S.A.; **M. L. Haider,** president, International Petroleum Corp.; **C. G. Herrington,** vice president, Carter Oil Co.; **Charles Leet,** director, Creole Petroleum Corp.; and **Carl O. Tongberg,** vice president, Carter Oil Co.

Robert S. Ryan, petroleum engineer with Pan American Petroleum Corp., has been transferred to Cody, Wyo., from Midwest, Wyo.

Richard J. Graf, division geophysicist at Casper, Wyo., for Shell Oil Co., has been appointed senior geophysicist of the division.

J. T. Collins, engineering trainee with Gulf Oil Corp., has been promoted to production engineer and transferred to Beaumont, Tex., from Hull, Tex.

W. Scott Jackson, engineer with Fish Northwest Constructors, Inc., has been appointed staff engineer and temporarily transferred to Salt Lake City from Houston.

J. F. Dudley, chief engineer for Commercial Solvents Corp., and **Graham W. McMillan,** manager of development, have been elected vice presidents. Dudley will be vice president for production and engineering. McMillan will be vice president in charge of research and development and will have charge of operation of the company's Terre Haute, Ind., central research laboratories.

Robert S. Haigh, geologist in the Billings, Mont., district of Lion Oil Co., has been appointed district geologist in the Bismarck, N. D., production and exploration district. A graduate of the University of Oklahoma, Haigh has been with Lion since 1954. At Bismarck he replaces **Ray L. Harrison, Jr.,** who resigned recently to join Cardinal Drilling Co. as exploration manager.

Ernest K. Dodson, manager of Cosden Petroleum Corp.'s Midland, Tex., land department, has been elected an administrative vice president. Dodson has been acting as vice president in charge of the producing division substituting for **Marvin M. Miller,** now attending the advanced management school of Harvard School of Business Administration.

T. W. H. Dee, managing director of Australian Oil & Gas Corp., Ltd., Sydney, Australia, and **Eric A. Rudd,** geological consultant for several oil firms and professor of economic geology at the University of Adelaide, South Australia, are currently touring the United States in an effort to interest American companies in Australian exploration. About six rigs are working in Australia at the present time. The country has had one well showing commercial production.

George M. Burge, formerly with Midstates Oil Corp. in Wichita, has opened consulting offices there.

Robert E. Strong, petroleum engineer with Pan American Petroleum Corp. in Duncan, Okla., has been transferred to Oklahoma City.

H. L. Shockley has been elected president of Gibson National Oils, Ltd., Calgary. **W. H. Green** has been named vice president.

Walter Dannenbaum, Du Pont Co. vice president, director, and executive committee member, has been appointed a director of Atlantic Refining Co. He will complete the unexpired term of **N. S. McCausland,** who has resigned.

Karl E. Schmidt, vice president and engineer of Michigan Consolidated Gas Co., has been elected chief engineer of the parent organization, the American Natural Gas Co. Schmidt was also named vice president and engineer of Michigan Wisconsin Pipe Line Co., American Louisiana Pipe Line Co., and American Natural Gas Service Co., all subsidiaries of American Natural Gas. Schmidt has been with Michigan Consolidated since 1936.

DEATHS

William Woodward, 78, retired South Pasadena, Calif., oil developer, died February 21. Woodward, owner of Huntington Beach Oil Co., is credited with bringing in the first well in Huntington Beach field.

Harold D. Skyrm, vice president and director of General American Transportation Corp., died February 24 in Chicago after a heart attack.

Phillip Otto Teter, 59, general superintendent for Cities Service Pipeline Co. in Bartlesville, Okla., died February 24 in Bartlesville after a heart attack.

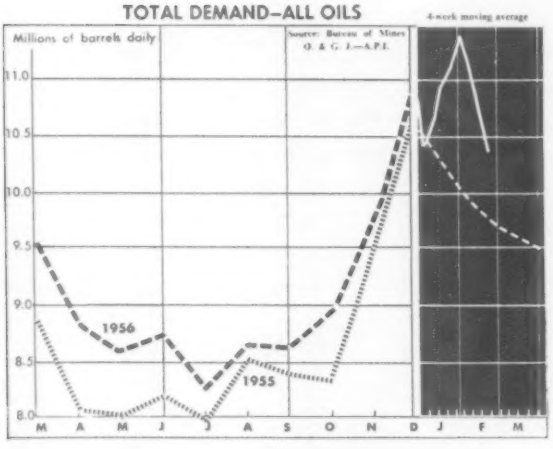
James C. McGann, 37, geophysicist for Continental Oil Co. in Enid, Okla., was killed in an auto accident February 25 near Billings, Okla.

Joseph F. Joy, 73, founder and in recent years a consultant with Joy Manufacturing Co., died February 19 in Fort Pierce, Fla.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,566,175	UP	48,800	UP	289,523
Crude stocks	250,525,000	DOWN	402,000	DOWN	6,120,000
Completions	849	DOWN	132	DOWN	132
Refinery runs	7,795,000	DOWN	181,000	DOWN	289,000
Gasoline stocks	204,122,000	UP	1,868,000	UP	10,134,000
Kerosine stocks	21,723,000	DOWN	829,000	UP	3,039,000
Distillate stocks	87,895,000	DOWN	3,490,000	UP	13,565,000
Residual stocks	35,772,000	DOWN	40,000	DOWN	1,330,000
Four-product stocks	349,512,000	DOWN	2,491,000	UP	25,408,000
Total imports	1,437,000	DOWN	32,000	UP	54,900



More Underground Storage Will Be Needed for L.P.G. This Summer

PRODUCERS of liquefied petroleum gas still may have to do some close figuring to get next summer's surplus output into storage. Additions to inventories reached an all-time high in 1956. There won't be too much room for additional growth this year.

Total storage capacity at the start of the heating season last fall was about 800 million gallons. This included aboveground storage at plants and terminals as well as underground capacity.

Note on the table that stocks climbed from 166.6 million gallons at the end of February to almost 700 million at the end of October. The total off-season stock increase was 533 million gallons. Can space be found for 533 million gallons this summer?

At the end of January, the stock total was 435 million gallons. Stock reductions after the end of January normally are small. Before 1955, most years showed small stock increases in February and larger gains in the following months. The drop in February 1955 was 44 million gallons and was only 13 million in 1956. There have been no reductions in March in recent years.

Considering the relatively mild weather in February this year, the reduction probably was less than 50 million barrels. There is little chance that it was more than 60 million.

Using a 60-million reduction from the end-of-January total of 435 million barrels, gives a starting point of 375 million barrels. Even if another 25 million barrels is allowed for unusual stock withdrawals in February, operators would start the spring and summer season with 350 million gallons.

Assuming maximum net additions no greater than the 533 million in 1956 would give peak inventories of 883 million gallons sometime next fall. This would more than fill the 800-million-gallon storage capacity available last fall.

Some additional storage capacity already has been added. Other projects will be started during the summer months. But, even with these additions, total capacity probably will not go above 900 million gallons this year.

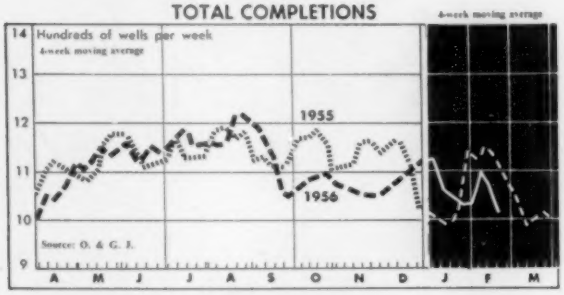
It still will take some close figuring to put 883 million gallons of products into containers holding only 900 million gallons despite the increasing volumes needed for pipeline fill.

PRODUCTION AND STOCKS OF LIQUEFIED PETROLEUM GASES
(Thousands of gallons)

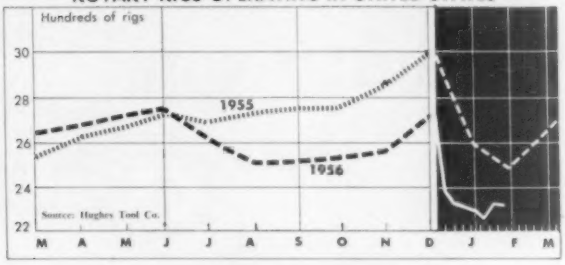
	L.P.G.		L.R.G.	
	Prod. at plants	Stocks*	Prod. at refineries	Stocks
1956—				
January	562,590	179,153	189,672	33,810
February	529,430	166,574	174,552	32,592
March	554,919	208,879	178,206	32,676
April	498,439	261,568	184,044	36,298
May	495,435	351,969	186,102	42,294
June	472,440	451,898	168,504	44,688
July	475,390	528,849	191,856	47,250
August	508,834	570,975	181,482	44,562
September	516,107	665,488	180,432	53,970
October	525,229	699,530	176,862	51,828
November	557,990	650,294	174,132	48,972
December	583,602	567,430	214,371	60,224
1957—				
January	590,837	435,458	196,322	55,835

*At plants, terminals, and underground.

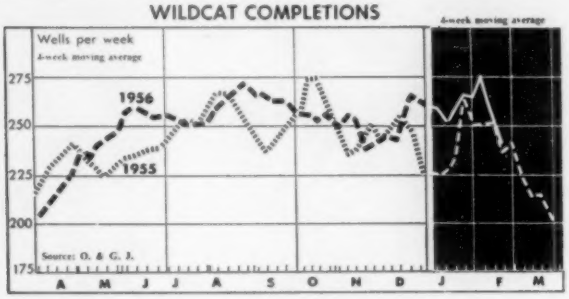
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	2-25-57	2-18-57	2-27-56
North Central and East	84	49	77
Southeast	32	23	28
Okla., Kans., Ark., Mo.	401	410	498
Louisiana	451	451	409
North and East Texas-Panhandle	367	396	432
Gulf and South Texas	229	228	285
West Texas-New Mexico	465	490	512
Rocky Mountain	199	188	201
Pacific Coast	98	101	131
Total United States	2,326	2,336	2,573
Western Canada	254	240	226

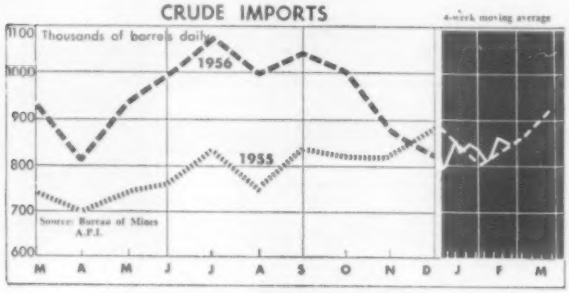
*Hughes Tool. Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 23, 1957

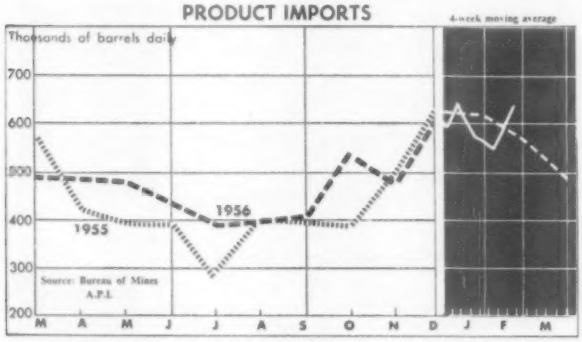
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1957				
	Comp.	Oil	Gas	Dry	Footage	1957	1956	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	*2	0	0	22,978	6	17	0	0	0	0	0	0	0	0	3	3
Arkansas	9	8	1	0	24,951	164	103	0	0	0	2	2	3	0	0	22	25
California	27	22	2	3	159,179	308	292	0	0	0	2	2	4	0	2	74	80
Colorado	13	0	5	8	70,648	175	176	0	0	1	7	8	5	0	2	111	118
Illinois	45	22	0	23	101,490	381	618	3	0	0	4	7	6	0	0	83	89
Indiana	9	4	0	5	10,767	105	102	0	0	0	1	1	3	0	0	15	18
Kansas	56	30	5	†21	217,366	639	729	3	0	0	9	12	21	0	3	95	119
Kentucky	20	6	3	11	30,006	230	291	0	0	0	7	7	7	0	1	45	53
Louisiana	71	30	12	29	681,291	577	645	4	0	3	10	17	16	4	17	67	104
North	17	11	1	5	77,008	232	248	0	0	1	4	5	2	0	2	24	28
South	43	13	7	23	483,153	259	317	2	0	1	6	9	8	4	13	39	64
Offshore	11	6	4	1	121,130	86	80	2	0	1	0	3	6	0	2	4	12
Michigan	8	5	0	3	27,586	60	81	0	0	0	2	2	3	0	0	23	26
Mississippi	6	3	0	3	34,117	45	70	0	0	0	2	2	3	0	0	17	20
Montana	4	3	0	1	20,062	48	64	0	0	0	0	0	1	0	0	16	17
Nebraska	18	5	0	13	98,289	121	135	2	0	0	11	13	7	0	0	67	74
New Mexico	41	19	14	8	200,476	309	302	3	0	0	5	8	13	0	4	36	53
Northwest	17	3	13	1	46,950	116	105	2	0	0	0	2	6	0	3	9	18
Southeast	24	16	1	7	153,526	193	197	1	0	0	5	6	7	0	1	27	35
North Dakota	7	4	0	3	35,064	51	34	0	0	0	2	2	3	0	0	16	19
Ohio	14	6	5	†3	35,737	145	165	0	0	0	1	1	0	0	0	3	3
Oklahoma	117	69	2	‡46	387,587	1,059	1,375	1	0	0	12	13	20	3	0	101	124
Pennsylvania-New York	4	0	2	2	27,169	45	106	0	0	2	1	3	0	0	5	12	17
Texas	347	224	17	106	1,332,614	3,429	3,272	7	1	4	65	77	116	5	40	827	988
Southwest (1 & 4)	51	31	1	19	189,457	404	468	0	0	1	10	11	15	2	14	129	160
Gulf Coast (2 & 3)	17	3	4	10	117,069	388	421	0	0	1	8	9	11	0	20	113	144
East (5 & 6)	14	3	5	6	84,617	205	202	0	0	0	2	2	3	0	0	55	58
N. Central (7-B & 9)	148	85	1	62	322,422	1,287	1,123	6	0	0	39	45	58	0	2	392	452
West (7-C & 8)	89	79	2	8	488,508	911	879	1	0	1	6	8	27	0	3	120	150
Panhandle (10)	28	23	4	1	130,541	234	179	0	1	1	0	2	2	3	1	18	24
Utah	4	3	0	1	24,559	22	13	0	0	0	1	1	3	0	0	9	12
West Virginia	11	0	9	2	37,298	109	105	0	0	0	0	0	0	0	6	2	8
Wyoming	14	5	1	8	47,810	129	125	1	0	1	6	8	7	0	1	41	49
Misc. (Nev., S. D.)	2	0	0	2	15,028	14	30	0	0	0	2	2	0	0	1	7	8
Total U. S.	849	470	78	301	3,642,072	8,171	8,850	24	1	11	152	188	241	12	82	1,692	2,027
Total previous week	981	551	64	366	4,106,278	....	....	29	0	12	197	238	217	11	71	1,540	1,839
Total Feb. 25, 1956	981	559	58	364	4,151,665	....	....	32	1	8	157	198	267	28	60	1,646	2,001
Cumulative 1957	8,171	4,374	591	3,206	33,789,707	....	....	....	....	....	....	....	....	....	....	....	....
Western Canada	53	34	2	17	247,971	341	....	0	0	0	14	14	5	0	6	71	82

Service wells included: †1, ‡5. *Alabama.

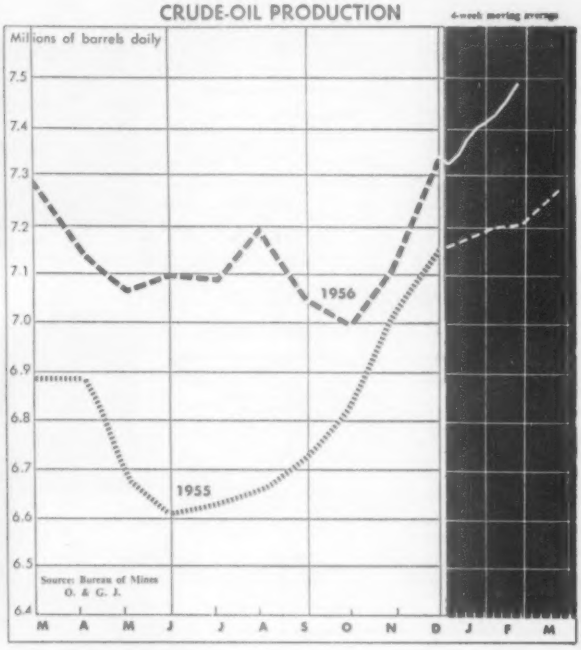
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



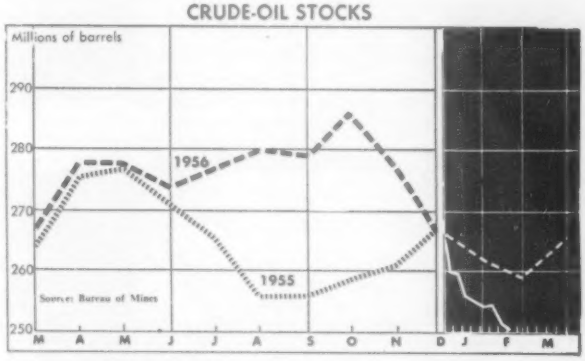
DAILY AVERAGE PRODUCTION FOR WEEK

February 23, 1957

	Crude oil	Lease condensate	Total	Feb. 16 total
Alabama	11,300		11,300	11,350
Arkansas	80,600	500	81,100	81,100
California	937,700		937,700	938,300
Colorado	159,000		159,000	161,200
Eastern	49,900		49,900	50,100
Florida	1,250		1,250	1,250
Illinois	234,900		234,900	230,400
Indiana	32,800		32,800	32,000
Kansas	†363,100		†363,100	†358,750
Kentucky	50,400		50,400	50,700
Louisiana	898,000	78,000	976,000	975,400
North	127,000	3,000	130,000	129,400
South	771,000	75,000	846,000	846,000
Michigan	26,800		26,800	26,500
Mississippi	107,550	5,200	112,750	112,750
Montana	70,400		70,400	69,250
Nebraska	38,650		38,650	37,850
Nevada	100		100	100
New Mexico	253,250	4,975	258,225	258,275
North Dakota	39,100		39,100	43,450
Oklahoma	†675,100		†675,100	†640,400
Texas	3,074,000	56,350	3,130,350	3,130,350
Dist. 1	56,000	525	56,525	56,525
Dist. 2	152,000	8,950	160,950	160,950
Dist. 3	432,000	26,500	458,500	458,500
Dist. 4	238,000	6,500	244,500	244,500
Dist. 5	42,000	500	42,500	42,500
Dist. 6	138,000	6,350	144,350	144,350
East Texas field	214,000		214,000	214,000
Dist. 7-B	165,000	100	165,100	165,100
Dist. 7-C	171,000	4,400	175,400	175,400
Dist. 8	1,156,000	1,425	1,157,425	1,157,425
Dist. 9	212,000	825	212,825	212,825
Dist. 10	98,000	275	98,275	98,275
Utah	10,950		10,950	12,300
Wyoming	306,200		306,200	295,500
Others	‡100		‡100	‡100
Total U. S.	7,421,150	145,025	**7,566,175**	7,517,375
Change from previous week, up			**48,800**	
Canada	†562,197		†562,197	†565,100
Total U. S. production January 1-Feb. 23				402,313,725 bbl.
Same period last year (crude plus cond.)				*388,592,300 bbl.

*Includes 6,879,210 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

CRUDE-OIL STOCKS

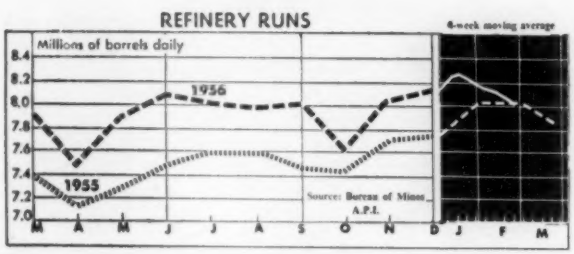


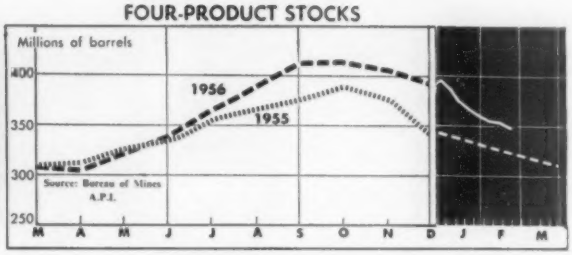
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

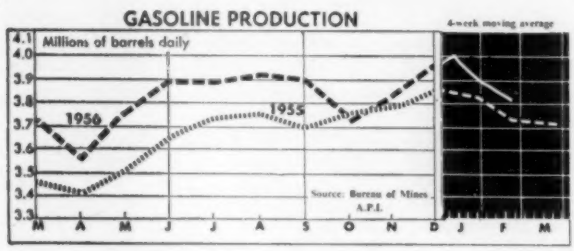
(Thousands of barrels)

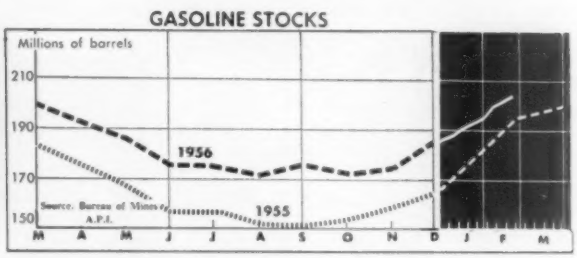
	2-16-57	2-9-57	2-18-56
Pennsylvania Grade	2,384	2,360	2,713
Other Appalachian	2,065	2,076	1,816
Illinois, Indiana, Michigan	10,071	10,260	9,259
Nebraska, North Dakota	2,192	2,112	2,193
Kansas	9,188	9,446	8,094
Oklahoma	20,955	21,179	22,647
Arkansas	2,279	2,926	2,145
Louisiana	18,903	19,229	16,431
North	2,825	2,910	2,581
South	16,078	16,319	13,850
Mississippi	2,061	2,707	2,967
New Mexico	7,423	7,575	7,804
Texas	112,685	109,399	120,696
East Texas proper	9,861	8,279	8,785
West Texas	52,886	51,672	58,988
Texas Gulf	21,399	20,714	22,534
Other Texas	28,539	28,734	30,389
Wyoming	15,518	15,722	15,235
Other Rocky Mountain	6,028	6,124	5,208
California	27,475	27,314	28,209
Foreign	†11,298	12,498	11,228
Total	250,525	250,927	256,645

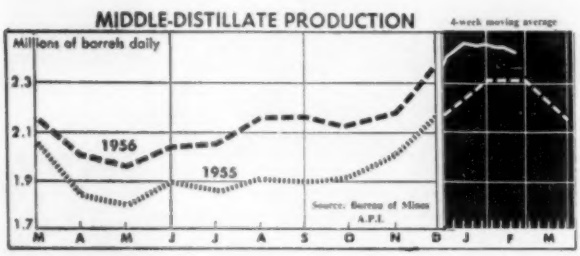
*Bureau of Mines. †Includes 2,922,000 bbl. in California.

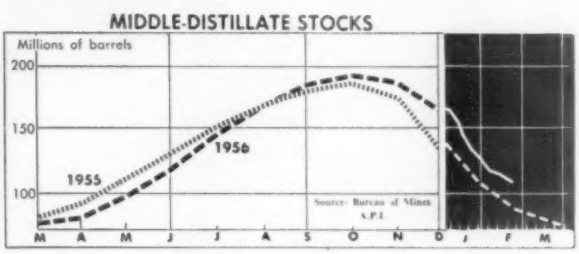


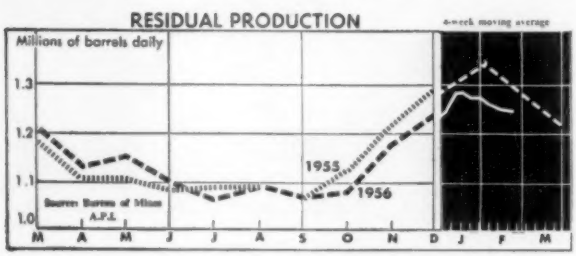


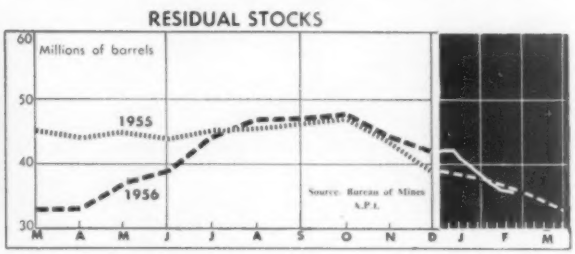

GASOLINE PRODUCTION
Millions of barrels daily
4-week moving average
1956
1955
Source: Bureau of Mines A.P.I.
M A M J J A S O N D J F M




MIDDLE-DISTILLATE PRODUCTION
Millions of barrels daily
4-week moving average
1956
1955
Source: Bureau of Mines A.P.I.
M A M J J A S O N D J F M




RESIDUAL PRODUCTION
Millions of barrels daily
4-week moving average
1955
1956
Source: Bureau of Mines A.P.I.
M A M J J A S O N D J F M



A.P.I. REFINERY REPORT, FEBRUARY 22, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, February 1956: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,144	467.7	35.0	332.7	210.6	41,923	9,568	30,785	8,802	1,116	463.4	42.3	304.3	239.6
Appalachian:														
District 1	102	35.7	7.3	24.4	8.3	4,995	443	2,094	334	99	39.7	4.8	25.6	9.3
District 2	107	55.1	6.7	20.9	16.6	3,062	377	765	332	107	52.5	7.0	21.2	15.1
Ind., Ill., Ky.	1,391	671.7	70.8	328.3	192.1	36,966	4,016	13,221	4,318	1,423	710.5	78.5	302.8	199.2
Minn., Wis., Dak.	100	49.7	4.1	28.1	7.6	7,104	640	4,610	262	92	43.4	11.9	17.0	9.2
Okla., Kans., Mo.	679	375.9	18.3	178.3	46.4	20,267	845	8,245	1,040	715	399.4	15.8	188.3	41.4
Inland Texas	271	203.2	11.0	47.3	21.6	8,660	337	1,329	1,807	275	182.7	9.7	50.5	28.3
Texas Gulf Coast	1,790	807.6	101.1	517.0	236.9	28,968	2,638	8,471	5,218	2,025	888.9	138.9	553.1	258.4
La. Gulf Coast	680	320.4	66.5	224.7	61.4	12,665	1,458	4,583	1,640	692	325.0	55.2	204.8	63.5
N. La. and Ark.	102	40.6	6.4	29.1	7.4	5,284	796	1,988	205	95	36.4	9.3	20.6	5.8
Rocky Mountain:														
New Mexico	26	13.9	0.5	4.9	3.4	491	9	122	61	21	11.8	0.4	3.2	3.1
Other Rocky Mtn.	279	128.1	2.4	64.1	35.7	7,465	297	2,350	958	278	130.1	4.2	66.0	44.2
California	1,124	498.0	1.0	179.9	387.9	26,272	299	9,332	10,795	1,109	461.5	7.0	160.6	368.8
Feb. 22, 1957	7,795	3,667.6	331.1	1,979.7	1,235.9	204,122	21,723	87,895	35,772	8,047	3,745.3	385.0	1,918.0	1,285.9
Feb. 15, 1957	7,976	3,761.0	372.9	2,097.9	1,240.3	202,254	22,552	91,385	35,812					
Feb. 24, 1956	8,084	3,769.9	365.0	1,975.6	1,261.1	193,988	18,684	74,330	37,102					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	12.00-12.25
Premium (96 octane)	13.75-14.00
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.25-11.50
Regular (92 octane)	11.50-11.75
Premium (97 octane)	13.25-13.50
Premium (98 octane)	13.50-14.00
California (rack):	
Regular (84 octane)	13.1
Premium (93 octane)	14.1
Premium (96 octane)	15.1
Caribbean area (cargoes):	
Regular (87 octane)	11.00
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	5.0
Breckenridge:	
Grade 26-70	4.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.50-10.75
Diesel oil (58 d.i. and above)	10.125-10.375
Distillate No. 1	10.125-10.375
Distillate No. 2	9.50-9.75
Gulf Coast (cargoes):	
Kerosine 41-43	10.75-11.00
Distillate No. 2	10.25-10.50
New York Harbor (barges):	
Kerosine 41-43	12.25
Distillate No. 2	11.65
Diesel fuel, 48-52 d.i.	11.95
Caribbean area (cargoes):	
Distillate No. 2	10.25

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.40-2.50
Gulf Coast (cargoes):	
Bunker C fuel	$2.75-3.00
New York Harbor (barges):	
Bunker C fuel	$3.30-3.40
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.75-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.67				
15-15.9	2.71				$1.89
16-16.9	2.74				1.94
17-17.9	2.78				1.99
18-18.9	2.82				2.04
19-19.9	2.85				2.09
20-20.9	2.89	$2.75		$2.62	2.14
21-21.9	2.93	2.77		2.64	2.19
22-22.9	2.97	2.79		2.66	2.24
23-23.9	3.01	2.81	$3.44	2.68	2.29
24-24.9	3.05	2.83	3.46	2.70	2.34
25-25.9	3.09	2.85	3.48	2.72	2.39
26-26.9	3.13	2.87	3.50	2.74	2.44
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95		2.82	2.63
31-31.9	3.38	2.97		2.84	2.67
32-32.9	3.44	2.99		2.86	2.71
33-33.9	3.50	3.01		2.88	2.75
34-34.9	3.56	3.03		2.90	2.79
35-35.9	3.61	3.05		2.92	2.83
36-36.9	3.65	3.07		2.94	2.87
37-37.9	3.68	3.09		2.96	2.89
38-38.9		3.11		2.98	2.91
39-39.9		3.13		3.00	2.93
40 and up		3.15		3.02	2.95

*Includes Oklahoma, most of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low Cold test Gulf Coast. ‡Sour.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, January 16, 1957.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.88
Middle District	4.70
Southwest Pennsylvania	4.41
West Virginia	4.23
Buckeye Grade	4.23
Zanesville Grade	3.27
Illinois Basin	3.15
Canada:	
Leduc-Woodbend (flat prices D-2), D-3)	2.78
Redwater (Alta.) D-3	2.67
Smiley-Viking (Sask.)	2.44
Pembina	2.65

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 40°-40.9°, Puerto La Cruz	3.37
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

N.W.I.-U.S.N.H., dirty (USMC +200%)	$8.10
★ N.W.I.-U.K., dirty (Scale+290%) (126s. 9d.)	17.71
Gulf-France, dirty (USMC+185%)	21.80
★ P.G.-France, dirty (Scale+335%) (352s. 0d.)	49.25

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CORE DRILLS, SPUDDERS, ROTARIES. New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

FOR SALE—One 6⅛" to 13" OD full Landis pipe threading machine. Contact Otto Bendorf, Oil Field Salvage Company, Breckenridge, Texas.

FOR SALE EQUIPMENT

STRUCTURAL STEEL BUILDING—12' x 35' x 120', located near Stillwater, Okla. Boswell-Frates Company, 1003 Kennedy Building, Tulsa, Oklahoma.

BESSEMER GAS COMPRESSORS—3 type 10 twins direct connected units—Boswell-Frates Company, 1003 Kennedy Building, Tulsa, Oklahoma.

FOR SALE EQUIPMENT

FOR SALE—Cardwell Spudder, RL502, complete with tools, equipment necessary for efficient operation. Price, inventory on request. K & A Drilling Co., Phone 448R, Box 497, Ellinwood, Kansas.

VESSEL—New 40-tray ASME code vessel fabricated 1956. Never installed. A-285-C-FBQ Steel, 5'6" diameter and 87'0" tangent. Maximum working pressure 267 psi at 650° F. Available for immediate shipment. The Fluor Corporation, Ltd., P. O. Box 7030, East L. A. Branch, Los Angeles 22, California, c/o Mr. R. M. Savage. Phone: ANgelus 2-6111.

5—55,000 bbl. 2—80,000 bbl. 2—10,000 bbl. tanks all steel and complete, cleaned, ready to dismantle or cut down load on cars $100.00 ton, or re-erect any place, strictly guaranteed including bottoms, located Oklahoma.

W. C. BERRY

Box 1858 Tulsa, Oklahoma

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NEAR LONGVIEW, TEXAS

FORMER LACY REFINERY

1—Wyatt 30" x 70' Stabilizer 160# 30 tray
1—5' x 96' tower, 40 tray, 135# WP.
1—2' x 50' tower, 24 trays.
1—Ethyl lead plant.
2—Upshot heaters, 10 mil. BTU/hr.
8—Welded storage tanks, 5,000, 2,000 bbl.
8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.

IN STOCK

VESSELS

2—12' x 45' Butane Tanks, 125#
2—12' x 45' Storage Tanks, 25#
1—14' x 21' Clay Tower, 125#
1—8' x 75' Tower, 20 Trays, 25#
1—18" x 32' Tower, 15 Trays, 160#
2—8½' x 23' Tanks 50#

HOT-OIL PUMPS

3 Pacific ITB, 400 gpm—2,000' hd, 735 gpm—3,100' hd.
5 Pacific SVTB, 612 gpm—600' hd, 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 GPM—408' Hd.
BJ hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.

HEAT EXCHANGERS

3—Kellogg Adm. Fltg. Hd. 2200, 1800 Sq. Ft., 315#
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18—GR Fin Tubes, 73 Sq. Ft.
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6—Adm. 785, 742, 425 Sq. Ft.
30—304 SS shell & tube condensers 100-1000 Sq. Ft.

COMPRESSORS

1 Worth LTC-6 800 hp.
3 Penn Comps 100 CFM 500 lbs.
385 CFM 160 lbs.

MISCELLANEOUS

6—Bird Centrifugals 32 x 50, 24 x 38, 18 x 28.
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4—Rotary Vac. Filters, 10 x 12, 8 x 10, 5 x 8.
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MECHANICAL ENGINEER for Major Oil Company in Mid-Continent area. Must be graduate engineer and have six to ten years supervisory and master planning experience in Refinery Mechanical and Maintenance Department. Address all replies giving age, education, resume of experience and salary expected to Box J-946, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER with Master's Degree, or Doctor's in Chemical, Mechanical, or Petroleum Engineering for research and teaching in Petroleum Production Engineering at rapidly growing southwestern institution. Rank and salary open, twelve months employment possible, consulting work encouraged and available in immediate area. Applications will be kept confidential. Box J-902, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

REFINERY CHEMIST. Independent oil company needs experienced chemist or chemical engineer, preferably with refining background. B.S. Degree. Opportunity for growth with rapidly expanding midwestern company. Write Box J-949, The Oil and Gas Journal, Tulsa, Oklahoma.

INDEPENDENT producing company has opening for young Petroleum Engineer as Field Production Superintendent in Southern Oklahoma area. Major company experience preferred. Must have initiative and be responsible person. Furnish details of education and experience in letter. All replies considered confidential. H. E. Wright, 3300 Republic Nat'l Bank Bldg., Dallas.

REFINERY ENGINEERS. Independent Mid-Continent refinery has openings for Chemical and Process engineers with refinery experience. Process engineering and economic analysis experience very desirable. B.S. degree. Give details and salary consideration. Box J-965, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION Superintendent, preferably with engineering background and degree, young and aggressive. Excellent opportunity for advancement. Oklahoma and Kansas experience. To work in field as well as office. P. O. Box 1797, Tulsa.

GRADUATE Petroleum Engineers needed to fill permanent position on Petroleum Engineering Faculty at Southwestern Louisiana Institute in Lafayette, Louisiana. M.S. or Phd. preferred, but will consider candidate for these degrees. Salary & rank depend on education and experience. Write G. G. Varvaro, Head Department of Petroleum Engineering, S. L. I. Lafayette, Louisiana.

PROCESS ENGINEER with thorough technical training and minimum background of eight years refining and hydrocarbon processing experience with special emphasis on catalytic reforming and petrochemicals. Send complete record of education, experience, and minimum salary expected. Write Box J-867, The Oil and Gas Journal, Tulsa, Oklahoma.

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REFINERY ENGINEER—Process Engineering position with large independent company operating in Mid-Continent area. One to five years experience desired. State qualifications and give salary requirements. Cooperative Refinery Association, Box 7305, Kansas City 16, Missouri.

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CHAMPLIN Oil & Refining Co. in Enid, Oklahoma has an opening in its laboratory for a recent graduate chemist. Applicants should furnish a brief personal history including education and professional experience. Address all inquiries to D. G. Perkins, Chief Chemical Engineer, Champlin Oil & Refining Co., Enid, Oklahoma.

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PRODUCTION MAN: Experienced in well completions and work overs. Presently employed. Twenty-five years experience in central Kansas area. Box J-960, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, Engineering Degree, 10 years interpretation, Party Chief experience Major Company. Seeks responsible position exploration, related fields. Box J-961, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMIST: Six years experience chief chemist. Light products and asphalts. Presently employed. Seek opportunity for advancement. Box J-962, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL and Petroleum Engineer with 6 years experience in drilling, production, and secondary recovery with major seeks opportunity with growing independent. Write Box J-964, The Oil and Gas Journal, Tulsa, Oklahoma, for complete resume.

GEOPHYSICIST with nineteen years interpretation and supervisory experience in the mid-continent area desires responsible position with oil company or operator. Box J-959, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION ENGINEER: Five years oil industry experience in production and exploration in U. S. and overseas, wants employment in North America, preferably West Coast. Box J-955, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN: Desires position with independent, possibly having mining interests. 2 years production clerk, 1 year scouting, 4½ years landman, 5 years hardrock mining. Prefer Rocky Mountains, other areas considered. Currently employed by major. 38, married, children. Bus. Adm. graduate. Box J-956, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER employed in eastern Oklahoma with experience in drilling, producing, reservoir work and 5 years water flood research, seeks responsible position in the production department of a company operating in shallow areas where considerable field work is required. Box J-958, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN with eleven years experience desires position. Location unimportant. Married with two children. Excellent references. Box J-950, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

THIRTY YEARS operations, administration and regulatory experience natural gas pipelines. Registered engineer. Box J-947, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES ENGINEER, 38, division representative, major equipment manufacturer. Sixteen years field and sales experience. Desires change, qualified reason. Box J-953, The Oil and Gas Journal, Tulsa, Oklahoma.

MANUFACTURER'S REPRESENTATIVE with fifteen years experience calling on Refineries, Pipeline Companies and Chemical Plants in Texas and Louisiana, desires one or two additional lines of specialty application items. Financial statement and references are available. Specialty Sales & Service Company, 1711 Bell Avenue, Houston 3, Texas.

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CAPITAL NEEDED. Joint Drilling Venture. Excellent Oil Prospects proven areas. Large or small investors should investigate today. We must drill now to hold properties. R. F. B. Drilling Company. Box 235, Wagoner, Okla.

WOULD LIKE to represent out of State Investors interested in buying royalties, leases or in Shallow drilling deals. For particulars write R. E. (Buck) Clement, Box 65, Norman, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties from acquisition to production. No properties too small, none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited. Write, wire or call collect for further information.

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is interested in investment capital to take interest in Class "A" deals approved by reputable consulting geologists on a cost basis.

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Box J-943,
The Oil and Gas Journal,
Tulsa, Oklahoma.

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480 ACRES in Coleman County, Texas, 180 acres in cultivation. Three producing oil and gas wells, 120 acres not under lease. Located in Novis field. Will sell land and mineral rights to settle estate. Contact C. B. Sprinkles, 422 W. Kennedy Ave., Coolidge, Arizona.

FOR LEASE—West Texas oil land for prospecting. Box 419, Upland, California.

OWN 460 ACRES in Linn County, Kansas, want lease. E. A. Tanquary, P. O. Box 97, Stanley, Kansas. Phone Olathe 2146W4. Highly improved stock ranch will sell.

OIL LEASES IN BOOMING

4-Corners Area. November Indian Lease sale brought 30 Million Dollars. Some leases sold for $3,200 per acre. Wells estimated up to 1500 barrels of oil per day. Oil Leases from $2.25 an acre. Fortunes being made. Write for free information now.

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CHAVES COUNTY, N. M.

Major Co.; well to drill testing Devonian & Ellenberger zones. Should be next major success. Recommend close in royalty & leases. Data on request.

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LEASE AND DRILLING BLOCKS

OIL, GAS AND MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2000 acres. Write quickly to: Jefferson G. Smith, 215 Littlefield Building, Austin 15, Texas.

UTAH OIL LEASES on U. S. owned land in all counties where leasing active. 640 acre leases. 5 years and renewable 5 more. Free information. John L. Donahue, Empire Bldg., Denver 2, Colorado.

ROYALTIES

1% OVERRIDE ROYALTY from settled production in Western Nebraska. Earning over 20%. Needs $6500 cash. Box J-963, The Oil and Gas Journal, Tulsa, Oklahoma.

PERPETUAL ROYALTY: Beaver County, Oklahoma, partially leased, 5 years. Phone or write Blankenship, 1235 So. Oswego, MAdison 6-5745, Tulsa.

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BARTLESVILLE SAND. New equipment, 5 wells producing. Proved locations to drill. Perfect for flood. Greenwood County, Kansas. Write Box 582, Eureka, Kansas. Phone 1094.

FOR SALE, Shackleford County, Texas, lease with one well, producing from Cook Sand, making allowable. Room for several more wells. Complete details on request. Texas Canyon Oil Company, 1209 Texas National Bank Building, Houston, Texas.

PRODUCTION WANTED

WANTED: Oil production 100 bbls. and up, any size, prefer Okla., N. M., Tex., Colo. or Kan. B. Thurston, 1427 Princeton NE, Albuquerque, N. M.

PRODUCTION WANTED: Leases with production, prefer West or Central Texas. Must have supporting records. Box J-918, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT TO BUY—Oil Properties, settled or semi-settled production. 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma.

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OKLAHOMA

NORTHERN OKLAHOMA

Rank Cherokee Reservoir Tapped in Alfalfa County

A rank Cherokee-Pennsylvanian discovery was reported in north-central Alfalfa County, northeast of the town of Cherokee and several miles southwest of the east-west Cherokee trend of that county and neighboring Grant County. The discovery well is Davon Drilling Co.'s 1 Grinder, C NE NW 30-27n-10w.

A drill-stem test at 5,167-5,207 ft. paid off with 25 bbl. per hour.

OKLAHOMA PANHANDLE

Mississippian Sand Oil Discovery in Panhandle

The first Mississippian sand production in Beaver County, Oklahoma Panhandle, has been discovered by Phillips Petroleum Co. at 1 Blakemore. The wildcat discovery is on a 1,280-acre unit in which Phillips owns a 50 per cent interest.

The well flowed at a daily rate of 824 bbl. of 36.1°-gravity oil from the Mississippian sand which was perforated from 6,542-63 ft. Previous Mississippian

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production in the Panhandle area has been from limestone formations. The well was plugged back from a total depth of 8,418 ft.

Phillips owns oil and gas leases on 5,140 net acres on this prospect and has an additional 91,875 net acres in Beaver County, which is in the heart of the Pennsylvanian sands trend that has yielded numerous recent discoveries extending throughout northwestern Oklahoma, the Oklahoma Panhandle, and the northern Texas Panhandle.

NEW MEXICO

SOUTHEAST NEW MEXICO

North Gladiola Field Extended by Big Well

Sunray Mid-Continent Oil Co. has announced completion of its 1 Z. Taylor in Lea County as a good flowing Devonian producer. Location in NW NE of 7-12s-38e is a ¾-mile southwest extension to southeast edge production in North Gladiola-Devonian field, and between that area and Gladiola field.

Initial potential was rated at 1,288 bbl. of 47° oil a day, based on a flow of 614.25 bbl. in 11½ hours. Tubing pressure was 600 psi. Producing perforations were at 11,974-94 ft. Total depth was 12,046 ft.

Sunray Mid-Continent holds 600 acres in the immediate area.

Deep well re-testing . . . Amerada Petroleum Corp. 1 Kelsay, Lea County wildcat between Bagley and Moore fields in northern Lea County, found oil shows in the Pennsylvanian. No. 1 Kelsay was originally drilled to 11,365 ft. by Cameron Oil Co. as a Devonian test.

New operators ran casing to 10,150 ft., and drill-stem tested in the Pennsylvanian at 9,960-10,052 ft. Recovery was 1,042 ft. of free oil plus heavily oil and gas-cut mud.

Location is in 28-11s-33e, 19 miles northwest of Tatum.

Successful Wildcats

ARKANSAS

Lafayette County: Don D. Montgomery et al, 1 MH. Ford estate, C NW NW 35-16s-24w. IPF 237 BOPD, 41.5°, Smackover 8,304-11 ft. TD 8,360 ft. Opens Kress City pool.

COLORADO

La Plata County: Murchison Trust 1-32 Government (Blk. 6), NE SW SE 32-33n-9w. IP 1,559 M.c.f. of gas per day, Mesaverde discovery, new field. TD 5,745 ft. Mancos.

Logan County: British-American Oil Producing Co. 5 Haley-Smith "B," C NE NE 25-11n-54w. IPF 177 BOPD, 177 BWPD, "J" sand discovery, new pay. TD 5,281 ft. "J" sand.

ILLINOIS

Jefferson County: F. L. Strickland 1 Gilbert, NE SW 25-4s-2e. IPF 140 BOPD, Salem 3,203-11 ft. TD 3,260 ft. New pay in Ina pool.

Perry County: Clyde Bassett 1 J. H. Bagwill, SW NW SW 28-4s-1w. IPF 2 BOPD, 100 BW, Cypress 1,152-64 ft. TD 1,184 ft. Opens South Tamaroa pool.

Williamson County: Rehn-Calverr 2 Rehn-Old Ben Coal Co. "B," SW NW NE 11-8s-1e. IP 20 BOPD, 18 BW, Aux Vases 2,393-2,414 ft., Rosiclare 2,473-81 ft., 2,520-27 ft., McClosky 2,538-43, 2,552-53 ft., TD 2,625 ft. Opens Clifford pool.

NORTH LOUISIANA

Claiborne Parish: Maritzky and Bibby 9 W. M. McClung estate, 29-21n-7w. IP 1,900 M.c.f. of gas per day, Woodruff sand 3,374-86 ft. TD 3,656 ft. Opens new pay in Homer field.

Ouachita Parish: Pan American Petroleum Corp. 1 Tina S. Parker, 1½ miles west of Brownsville in C NW SE 5-17n-3e. IPF 1,260 M.c.f. of gas plus 67 bbl. dist. per day, 52.1°, Cotton Valley 9,366-9,400 ft. TD 9,921 ft. Discovery of West Monroe field.

Winn Parish: L. H. Moon, et al 1 Luther Couch, NWc 7-10n-1e. IPP 8 BOPD, 90 BW, 20°, Wilcox 1,414-16 ft. TD 1,457 ft. Opens Curry pool.

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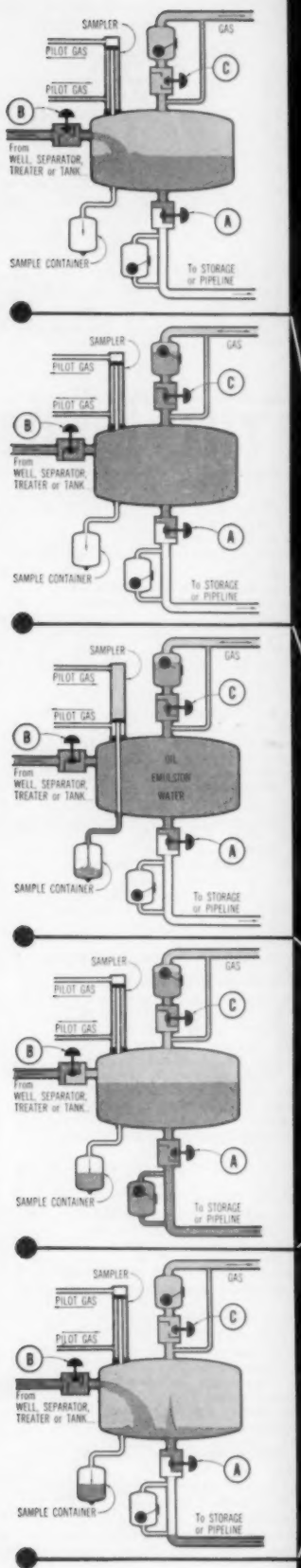

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The PVM* meter is liquid packed, sampled, and then counted as the liquid is discharged. Its accuracy is indisputable as to volume of liquid measured at the pressure-temperature condition of operation.

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- **DISCHARGING AND RECORDING** — Valve **A** now opens permitting vessel to empty the positive volume. The cycle counter is actuated. Valves **B** and **C** are still closed.
- **VALVES REPOSITION** — Valve **A** closes; Valve **C** is opened, dropping fluid into meter for measurement with next volume and Valve **B** opens for new cycle.

Write for Tank Topics on Metering Equipment

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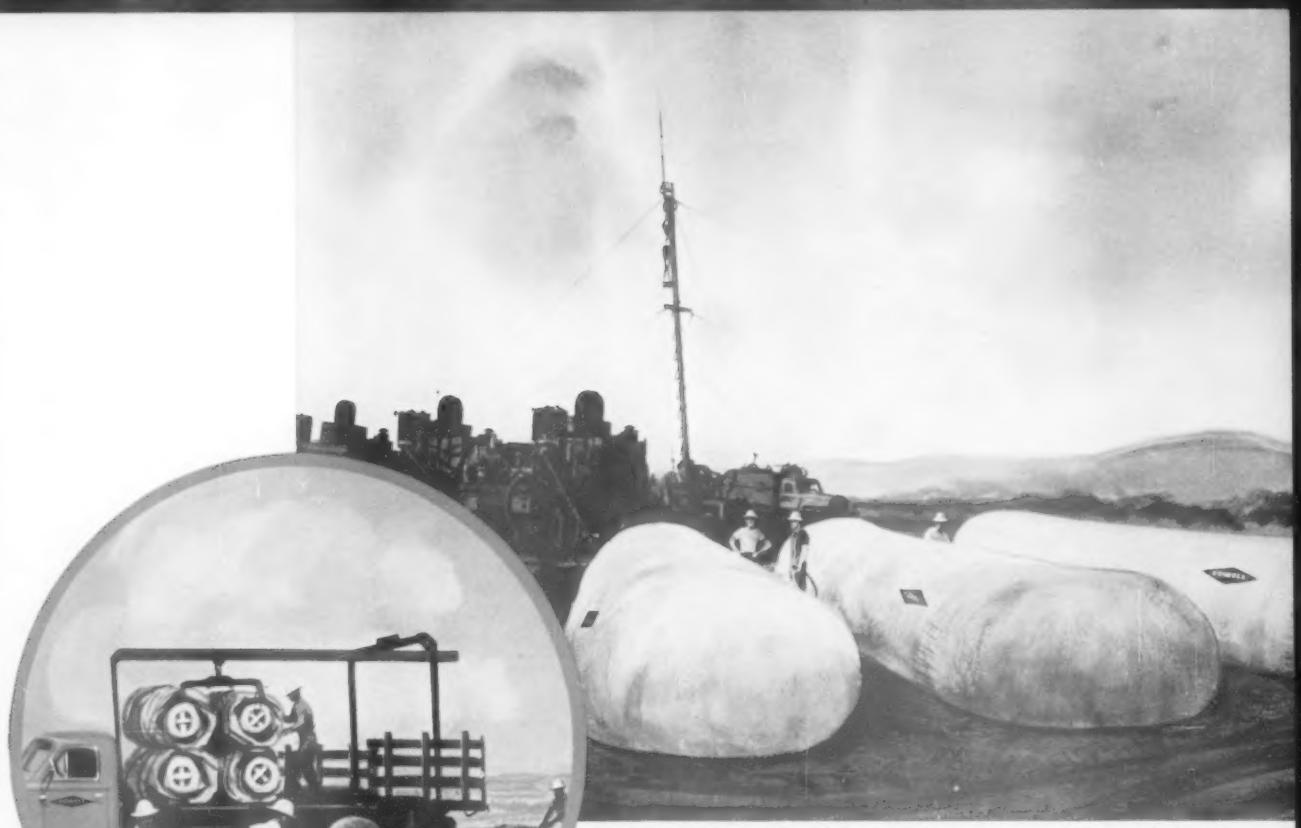

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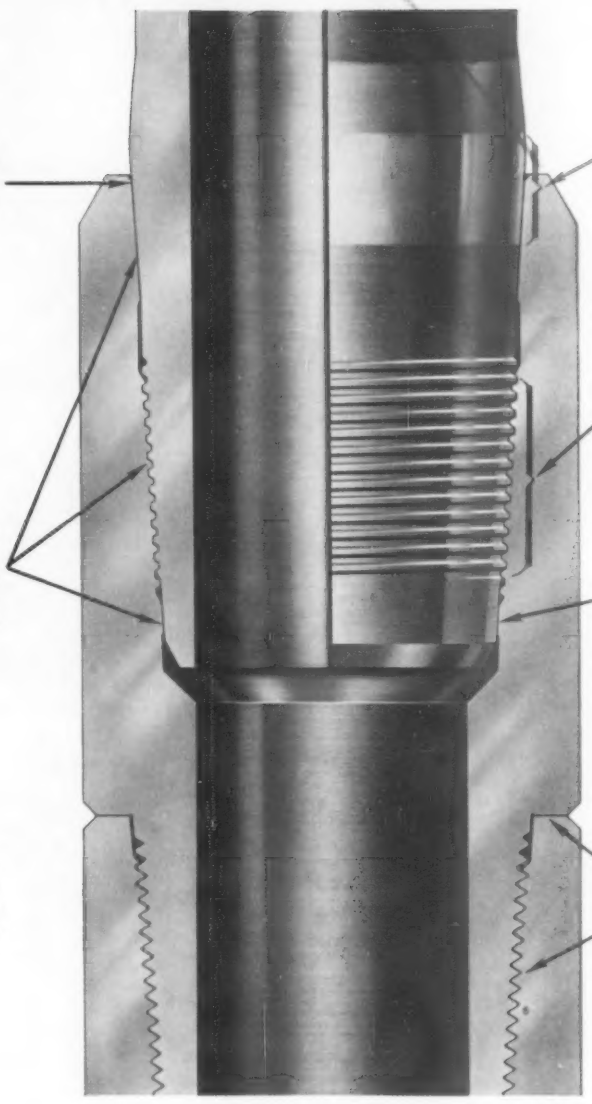
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